DOE/LLW-219

Mixed Waste Management Options: 1995 Update

National Low-Level Waste Management Program

May 1995

Idaho National Engineering Laboratory

June 16, 1995

Distribution

TRANSMITTAL OF REPORT, *MIXED WASTE MANAGEMENT OPTIONS: 1995 UPDATE,* DOE/LLW-219 - PDW-42-95

Enclosed is a document produced by the National Low-Level Waste Management Program entitled *Mixed Waste Management Options: 1995 Update*, DOE/LLW-219, May 1995. This report was prepared in response to a request for technical assistance from the Low-Level Radioactive Waste Forum on the issue of mixed waste management.

The objective of this report is to update information contained in the Mixed Waste Management Options report prepared in 1991. It provides a better understanding of the volume of mixed waste that cannot be treated out of existence and that will need to be disposed under joint AEA/RCRA regulations. Data from the *National Profile on Commercially Generated Low-Level Radioactive Mixed Waste* prepared by the U.S. Environmental Protection Agency and the U.S. Nuclear Regulatory Commission in 1992 was used as the basis for the volumes of commercial mixed waste the will require treatment and disposal.

The report is divided into two parts, a relatively short narrative followed by a more voluminous section containing three appendices. The report concludes that most, but not all, mixed waste can be treated by commercially available technologies and that the untreatable waste constitutes a very small percentage of generated and stored commercial mixed waste volumes.

Should you have any questions concerning the report or wish additional copies, please contact Kathleen Asbell at (208) 526-8330.

Sincerely,

P D Wheatley

Philip D. Wheatley
National Low-Level Waste Management Program

KAA:slf

Enclosure

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DOE/LLW-219

Mixed Waste Management Options: 1995 Update

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Purchase Order No. C95-175205

May 1995

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Prepared for the
U.S. Department of Energy
Assistant Secretary for Environmental Management
Under DOE Idaho Operations Office
Contract DE-AC07-94ID13223

EXECUTIVE SUMMARY

In the original *Mixed Waste Management Options* (DOE/LLW-134) issued in December 1991, the question was posed, "Can mixed waste be managed out of existence?" That study found that most, but not all, of the Nation's mixed waste can theoretically be managed out of existence.

Four years later, the Nation is still faced with a lack of disposal options for commercially generated mixed waste. However, since publication of the original *Mixed Waste Management Options* report in 1991, limited disposal capacity and new technologies to treat mixed waste have become available. A more detailed estimate of the Nation's mixed waste also became available when the U.S. Environmental Protection Agency (EPA) and the U.S. Nuclear Regulatory Commission (NRC) published their comprehensive assessment, titled *National Profile on Commercially Generated Low-Level Radioactive Mixed Waste* (National Profile).

These advancements in our knowledge about mixed waste inventories and generation, coupled with greater treatment and disposal options, lead to a more applied question posed for this updated report: "Which mixed waste has no treatment option?"

Beyond estimating the volume of mixed waste requiring jointly regulated disposal, this report also provides a general background on the Atomic Energy Act (AEA) and the Resource Conservation and Recovery Act (RCRA). It also presents a methodical approach for generators to use when deciding how to manage their mixed waste. The volume of mixed waste that may require land disposal in a jointly regulated facility each year was estimated through the application of this methodology.

In general, this approach leads a generator through three mixed waste management options in order of cost-effectiveness: avoidance, treatment, and regulatory. For purposes of estimating mixed waste volumes requiring jointly regulated disposal, each waste listed in the National Profile was grouped according to waste stream. In all, 17 waste streams were identified. The waste stream data were then compared with each option with the ultimate goal of minimizing the volume of mixed waste that ultimately requires jointly regulated disposal.

Because of the expected advances in commercially available treatment, the volume of mixed waste that may require jointly regulated disposal estimated in this study is considerably lower than the estimates presented in the National Profile.

Although new technologies continue to decrease the amount of mixed waste requiring land disposal and assuming practices identified in 1990 are still valid, treatment for an estimated 118 cubic meters of mixed waste per year is not commercially available. Contributing factors for this lack of available treatment relate to the small volumes of unique waste streams and the relatively high concentrations of radioactivity present in most of the commercially generated untreatable wastes. An additional 10 cubic meters of mixed waste requiring jointly regulated disposal results from the residues derived from treated listed wastes and contributions from poorly characterized waste. Based on the data provided in the National Profile, it is estimated in this study that 128 cubic meters of mixed waste per year cannot be managed out of existence.

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ACRONYMS AND ABBREVIATIONS

AEA	Atomic Energy Act
BDAT	best demonstrated available technology
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
DEACT	deactivation
DHS	Department of Health Services
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DSSI	Diversified Scientific Services, Inc.
EPA	U.S. Environmental Protection Agency
FFCA	Federal Facilities Compliance Act
GTCC	Greater-than-Class C
HPLC	high-pressure liquid chromatography
HSWA	Hazardous and Solid Waste Amendments
HWIR	Hazardous Waste Identification Rule
LDR	land disposal restriction
LLRWPAA	Low-Level Radioactive Waste Policy Amendments Act
LLW	low-level radioactive waste
LSC	liquid scintillation counting
MWIP	Mixed Waste Integrated Program
NARM	naturally occurring and accelerator-produced radioactive material
NORM	naturally occurring radioactive materials
NRC	U.S. Nuclear Regulatory Commission
PCB	polychlorinated biphenyl
PFF	Perma-Fix of Florida, Inc.
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
SEG	Scientific Ecology Group, Inc.
TC	toxic characteristic
TCLP	Toxicity Characteristic Leaching Procedure
TOC	total organic carbon
TSD	treatment, storage, and disposal

GLOSSARY[1]

Absorption: Any process in which a liquid is held in the interstices of an absorbent material, such as water being held in a sponge.

Agreement State: A state that has assumed, by virtue of an agreement with the Nuclear Regulatory Commission, certain regulatory and licensing responsibilities of the Commission.

Characteristic waste: Waste that exhibits specific physical or chemical characteristics described in 40 CFR 261 Subpart C. Specific characteristics are ignitability, corrosivity, reactivity, and toxicity.

Class A waste: Low-level radioactive waste that has low concentrations of long- or short-lived radionuclides. Class A waste must be disposed of separately from Class B and C waste unless it meets rigorous waste form requirements to ensure stability. Institutional control of access for up to 100 years will permit disposal of Class A waste without special provisions for intruder protection.

Class B waste: Low-level radioactive waste that has intermediate concentrations of long- or short-lived radionuclides. Class B wastes must meet more rigorous waste form requirements to ensure stability. Institutional control of access for 100 years will permit disposal of Class B waste without special provisions for intruder protection.

Class C waste: Low-level radioactive waste that has the highest concentrations of long- or short-lived radionuclides. Class C wastes must meet rigorous waste form requirements to ensure stability and must be disposed of at a depth of at least 5 meters below the surface or must be disposed of with intruder barriers designed to protect against inadvertent intruders for at least 500 years.

Commercial low-level radioactive waste (LLW): Low-level radioactive waste generated by commercial nuclear power plants, manufacturing industries, hospitals, universities, and research institutions. LLW does not include defense industry low-level radioactive waste.

Compact region: With regard to low-level radioactive waste disposal, a formal agreement entered into by two or more states, pursuant to the Low-Level Radioactive Waste Policy Act of 1980, as amended, for the purpose of establishing and operating regional disposal facilities. Compact regions are ratified by the party state legislatures and the Congress. Compact Commissions are authorized to restrict the use of their disposal facilities to wastes generated within the compact region.

Decay: The spontaneous transformation of one nuclide into a different nuclide or into a different energy state of the same nuclide. During decay, the unstable radioactive nucleus releases energy or particles. The process results in a decrease, with time, in the number of original radioactive atoms in the sample. Also referred to as radioactive disintegration.

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1. Illinois Department of Nuclear Safety, *LLW 1989 Annual Survey Report,* Springfield, Illinois, 1990.

Filtration: A process of removing radioactive particles from liquid waste by filtering. Filtration media may include cellulosic fibers, diatomaceous earth, and activated carbon. In some cases, the filtered liquid can be recycled. Filtration may also be applied to the removal of contamination from air by using HEPA (high-efficiency particulate air) filters or other kinds of filters.

Generator: Any person or entity that produces or possesses LLW in the course of or incident to manufacturing, power generation, processing, medical diagnosis and treatment, research, education, or other activity.

Half-life: The time in which half of the atoms of a particular radioactive substance disintegrate to another nuclear form. Each radionuclide has a specific half-life. Measured half-lives vary from millionths of a second to billions of years. Also called physical half-life.

Hazardous waste: Waste designated as chemically or biologically hazardous by Environmental Protection Agency regulations (40 CFR 261). When hazardous waste is combined with low-level radioactive waste, the combination is known as mixed waste. Both the radiological and the toxic properties of mixed waste must be considered in its management and disposal.

Incineration: A thermal treatment comprised of several technologies that use heat to destroy organic wastes.

Ion-exchange resin: An organic polymer used in an ion exchange column to remove the soluble ions from a solution that is passed through the column. Such columns are commonly used in nuclear power plants to remove radioactive material from the circulating cooling water.

Liquid scintillation counting fluid: A chemical solution that produces light when bombarded with radiation; used in numerous applications such as diagnostic testing and research. These solutions are a major component of institutional low-level radioactive waste. Also see "Organic liquid."

Listed waste: Wastes defined in 40 CFR 261 Subpart D are assigned an alphanumeric identification number. Listed wastes are known as P, U, K, or F wastes.

Low-level radioactive waste (LLW): Radioactive waste other than uranium mining or mill tailings, spent nuclear fuel, high-level waste, or greater than Class C waste. Low-level radioactive wastes contain radionuclides emitting primarily beta or gamma radiation and less than or equal to 100 nanocuries per gram of transuranic elements.

Mixed waste: Waste that contains a combination of low-level radioactive waste and hazardous materials. Hazardous components are those listed by the Environmental Protection Agency in Subpart D of 40 CFR 261, or those that exhibit any of the following four hazardous characteristics: ignitability, corrosivity, reactivity, or extraction procedure (EP) toxicity. Both radiological and chemical toxicity must be considered in its management and disposal.

Nuclear Regulatory Commission (NRC): Since January 19, 1975, the U.S. Nuclear Regulatory Commission has been the federal agency responsible for the licensing and regulation of commercial nuclear activity. The Commission also assists the U.S. Department of Transportation in regulating the transportation of radioactive materials and regulates the packaging of these materials for shipment.

Oils (contaminated): Lubricating or machine oil that becomes contaminated with radioactive materials.

Organic liquid: Carbon-based compounds such as alcohols, aldehydes, ketones, and organic acids. Organic liquid includes liquid scintillation media containing chemicals such as benzene, xylene, or toluene, and degreasing solvents such as carbon tetrachloride and freon.

Radioactive waste: Unwanted radioactive materials obtained from the processing or handling of radioactive materials.

Scintillation vial: A small plastic or glass vial used to contain scintillation fluid.

Stabilization: The structural support provided by the low-level radioactive waste form or the disposal module, which renders radioactive waste structurally stable to physical, chemical, or biological degradation.

Toxicity characteristic leaching procedure (TCLP): Total waste analysis or waste extract test to determine its leaching capability.

Transuranic: An element with an atomic number greater than 92, the atomic number of uranium. All known transuranic elements are radioactive and are produced artificially.

Treatment: Any method, technique, or process, including storage for radioactive decay, designed to change the physical, chemical, or biological characteristics or composition of any waste in order to render the waste safer for transport, storage, or disposal, amenable to recovery, convertible to another usable material, or reduced in volume.

Mixed Waste Management Options: 1995 Update

1. INTRODUCTION

1.1 Background

As defined by the Federal Facility Compliance Act (FFCA) amendments to the Resource Conservation and Recovery Act (RCRA, 42 USC 6901 et seq.), mixed wastes are wastes that contain both hazardous waste and source, special nuclear, or byproduct material subject to the Atomic Energy Act (AEA) of 1954 (42 USC 2011 et seq.). In accordance with U.S. Environmental Protection Agency (EPA)-published guidance (51 FR 24504, July 3, 1986), low-level radioactive wastes containing radioactive materials regulated under AEA and hazardous wastes regulated under RCRA are subject to both sets of statutory requirements. In particular, commercial low-level "mixed wastes" must meet treatment standards specified in 40 CFR 268 and waste form requirements detailed in 10 CFR 61 prior to disposal in a land-based unit meeting both RCRA and AEA standards.

The Low-Level Radioactive Waste Policy Amendments Act (LLRWPAA), enacted January 15, 1986, assigned to states or compact regions responsibility for the disposal of low-level radioactive wastes generated within that state or compact region after December 31, 1992. An interim milestone, January 1, 1990, required compact regions and noncompact member states to submit either complete license applications or written certifications. The governor's certification would commit the state to provide for the management of the low-level radioactive waste generated within its borders after December 31, 1992.

The governors' certifications included survey information detailing the amounts and types of mixed waste generated by the states. It was difficult to project estimated volumes of mixed waste that would require disposal because necessary treatment facilities were not yet constructed or permitted. However, the surveys indicated that the actual amount of waste that will require disposal in a facility meeting AEA and RCRA requirements would be considerably less than the amount of mixed waste generated.

This concept was confirmed in 1992 when EPA and the U.S. Nuclear Regulatory Commission (NRC) sponsored a comprehensive assessment of the Nation's mixed waste. This assessment, titled *National Profile on Commercially Generated Low-Level Radioactive Mixed Waste* (National Profile), compiled information on the volumes, characteristics, and treatability of commercially generated mixed waste by clearly defined facility categories. The National Profile indicated that 139,441 cubic feet of waste was generated, but only 11,954 cubic feet was untreatable (Klein et al., 1992). Estimates of very small volumes of mixed waste have led to a wide range of disposal cost estimates. They range from only small incremental increases for mixed waste compared with non-RCRA regulated waste disposed of at the same facility to as much as $15,000 per cubic foot if a separately established mixed waste disposal facility were developed independently for a small volume of mixed waste.

The regulatory burden, public opposition to new disposal sites, and relatively high cost of constructing proper disposal facilities make alternative strategies for management of mixed waste potentially more attractive than land disposal. This preference was highlighted in a letter dated April 15, 1990, from Ron Gaynor, Vice President, U.S. Ecology, to Don Womeldorf, Chief,

Environmental Management Branch, California Department of Health Services (DHS). In his letter, Mr. Gaynor stated:

> Rather than developing an expensive, eventually unnecessary mixed waste disposal facility, DHS can, within existing regulations and regulatory authority, determine that all mixed waste must be treated to the extent that it is no longer regulated as a hazardous waste.

In reaction to Mr. Gaynor's letter, California and several other states requested that the U.S. Department of Energy (DOE) explore the feasibility of generators being able to eventually stop the production of mixed waste requiring land disposal at jointly regulated facilities. Thus, the original *Mixed Waste Management Options* (DOE/LLW-134) report was issued in December 1991 and answered the question: "Can mixed waste be managed out of existence?" The answer to that question was that most, but not all, mixed waste can be managed theoretically out of existence.

1.2 Purpose

The primary objective of this study is to provide a better understanding of what mixed waste streams can and cannot be managed out of existence using the treatment technologies currently available and those soon to become available.

A second objective is to offer a current picture of the volume of mixed waste that cannot be treated out of existence and still needs to be disposed under the joint AEA/RCRA regulations. This study uses data from the National Profile that was not available when the original *Mixed Waste Management Options* report was issued. Additionally, several treatments are expected to become available within the next few years that were not included in the National Profile's estimates of treatability.

1.3 Methodology

Project objectives were accomplished in two phases. Under Phase I, existing and representative data about mixed waste were evaluated based on the subject areas outlined above. Specific treatment methods for each type of waste were identified. In Phase II, Federal regulations for delisting, no migration petitions, treatability variances, and Determinations of Equivalent Treatment were analyzed for applicability to the storage and disposal of mixed waste. The feasibility of applying these variances to the mixed waste streams analyzed in Phase I was also evaluated.

1.3.1 Phase I: Technology Review

Under Phase I, the mixed waste streams identified in the National Profile were individually evaluated and sorted according to their feasibility of being regulated solely under AEA or RCRA requirements. This task was accomplished in the following steps:

1. Grouping the data contained in the National Profile by:

    a. Sorting the mixed waste streams into characteristic waste categories (e.g., ignitable, corrosive, reactive, metals, characteristic organics)

b. Sorting the mixed waste streams into listed waste code categories (e.g., F001 and F002 wastes, F003 wastes, F005 wastes, and U- and P-listed wastes)

c. Sorting the mixed waste streams into other categories based on similarities of generation [e.g., liquid scintillation counting (LSC) wastes, other organics, miscellaneous wastes, oils, biological wastes, paint wastes]

d. Further sorting each of the waste categories by physical form.

2. Tabulating the volume and activity of each of the waste categories as reported in the National Profile. If information on a particular waste stream was missing, it was assumed that the missing information was not critical to the management of the waste.

3. Evaluating which of the commercial treatments that are currently available, and those likely to become available in the near future, could be employed for each waste stream. Each waste stream was placed in one of four categories:

   a. Wastes for which treatment currently existed

   b. Wastes for which treatment was likely to become available in the near future

   c. Wastes for which no treatment was known

   d. Wastes streams that were not sufficiently described in the National Profile to make a determination regarding the availability of treatment.

4. For those wastes having currently available treatment, tabulating estimates of post-treatment volumes requiring land disposal under joint regulation as mixed waste. Simplifying assumptions regarding volume reduction factors were used to make these estimates.

5. For those wastes having no known treatment, tabulating pre-treatment volumes of waste. Because of the land disposal restrictions, these wastes cannot be land-disposed without further treatment or regulatory justification. Therefore, estimates of wastes having no known treatment may not necessarily represent estimates of wastes requiring jointly regulated land disposal.

The evaluation generally followed the steps outlined in Figure 1-1.

1.3.2 Phase II: Review of Regulatory Alternatives to Treatment Requirements

Regulatory alternatives include delisting the waste under 40 CFR 261, and alleviating treatment requirements through preparation and submittal of no migration, treatability, and Determination of Equivalent Treatment variance petitions under 40 CFR 268. Approval of the delisting petition would allow disposal of "listed" mixed waste without regard to any RCRA Subtitle C requirements. Approval of a no migration variance under 40 CFR 268 would allow storage or disposal of mixed wastes without meeting EPA's prescribed treatment standards.

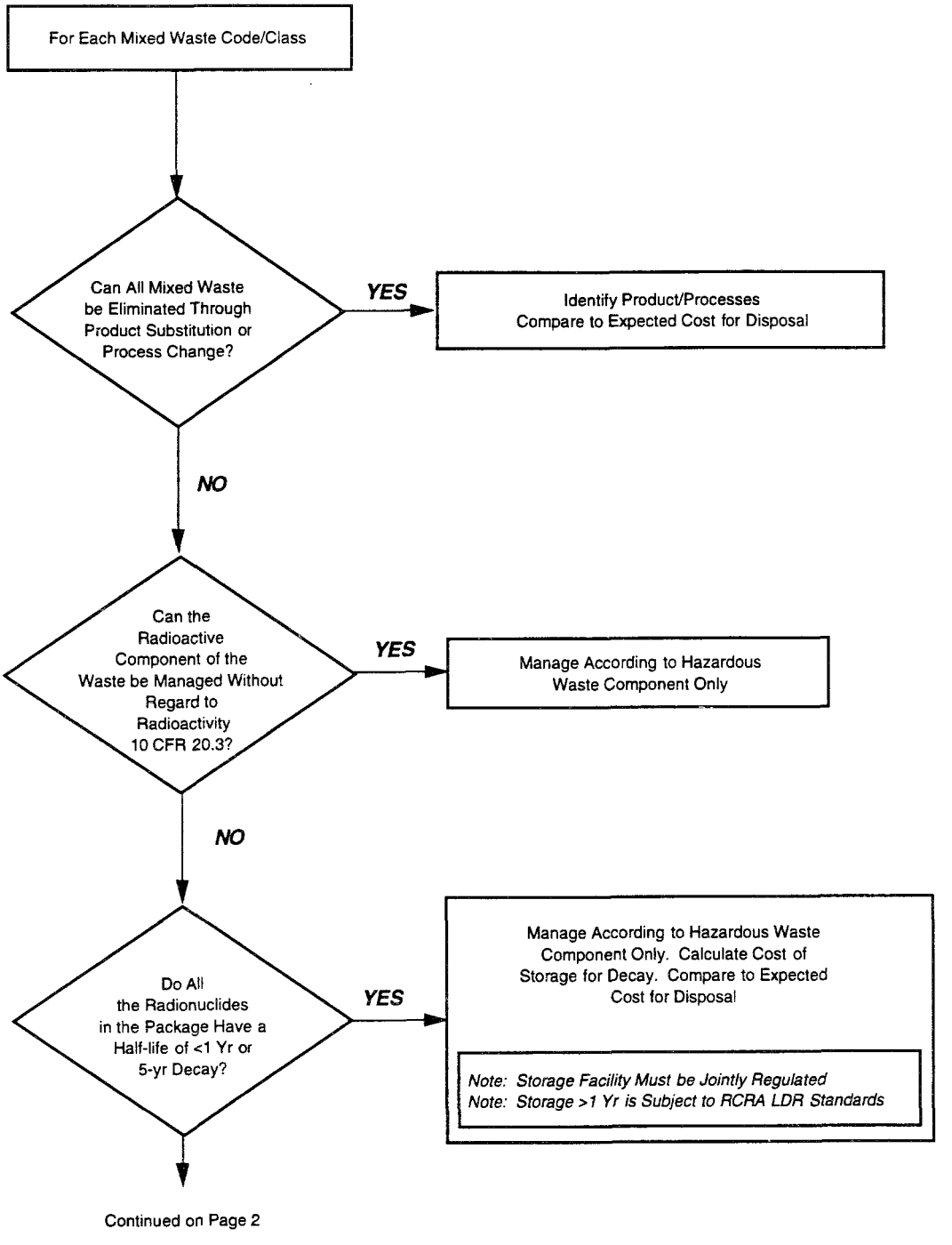

Figure 1-1. Mixed waste management schematic.

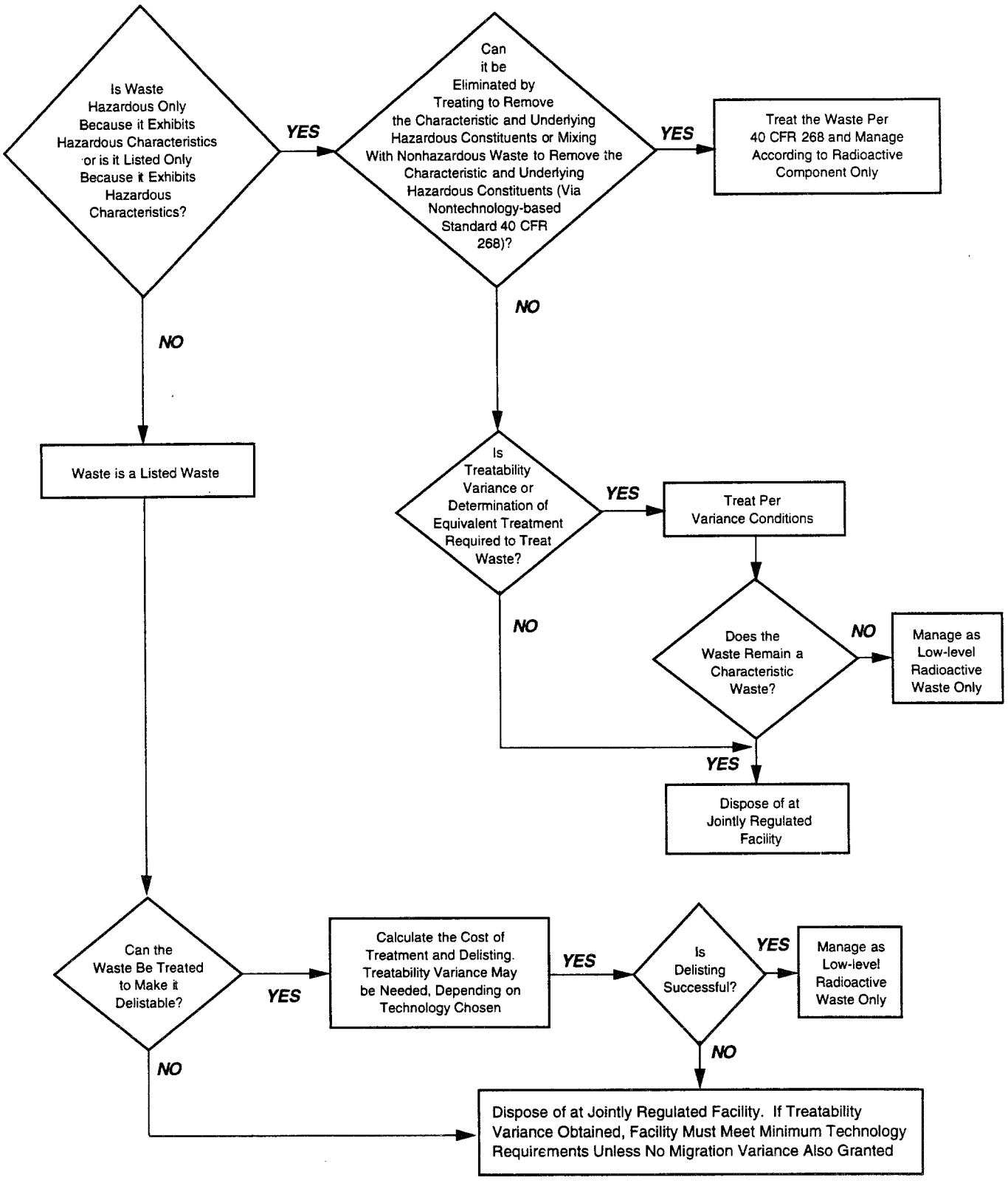

Figure 1-1 (continued). Mixed waste management schematic.

Receipt of a treatability variance under 40 CFR 268 could allow alternative or customized methods of treatment to those prescribed in the regulations. Hazardous waste statutes and regulations in states designated as host states for low-level radioactive waste disposal facilities were also compared with 40 CFR 268 standards for no migration petitions, delisting petitions, and treatability variances.

For listed wastes, the following additional topics were evaluated:

- Extraordinary treatment that may be necessary before delisting the wastes
- Tests, demonstrations, and evaluations necessary to delist the waste
- Assessment of costs and historical success involved with treatment and delisting of wastes.

Historical information regarding the success of the petitions was obtained from EPA officials in Washington, D.C., responsible for petition review. Information was also compiled and evaluated regarding waste elimination, including substitution of nonhazardous raw materials and avoidance of generation via process changes, recycling, and segregation of waste.

1.4 NARM Waste

The analyses outlined above did not include naturally occurring and accelerator-produced wastes (NARM). NARM wastes are not low-level radioactive wastes subject to NRC licensing since they are not regulated under the AEA of 1954, as amended. However, most states have regulatory programs controlling their use, possession, and disposal because their indiscriminate disposal is a threat to human health and to the environment. Large volumes of NARM wastes containing naturally occurring radioactive materials (NORM) are routinely generated as a result of mining, ore processing, and petrochemical exploration and refining activities. The Conference of Radiation Control Program Directors has developed draft regulations governing the use, possession, transfer, and disposal of NORM; however, these regulations are not mandatory aspects of a state radiation control program. Similarly, the Federal Government has been slow to uniformly regulate NORM. Disposal of NORM wastes resulting from beneficiating (i.e., processing) phosphate rock and uranium ores was considered early in the development of RCRA regulations (45 FR 33087, May 19, 1980). Since Congress was expected to remove this type of NORM from RCRA jurisdiction by virtue of the Uranium Mill Tailings Radiation Control Act, EPA undertook no further consideration of NORM under RCRA.

NORM wastes tend to represent large volumes of relatively low-activity wastes, usually having elevated concentrations of radium, uranium, and thorium, along with their decay products. Radiation control measures are aimed at controlling radon emanations from these NORM wastes. External radiation exposures are a secondary concern. Because of their similarity to uranium mill tailings, NORM wastes are often controlled by means similar to those applied to uranium milling operations. Tailings are required to be placed in lined areas, with sufficient cover to control radioactive emissions to levels that would not represent a hazard to neighboring residents. Concentrations of radium in surface and near-surface soils are usually controlled to specified levels. Groundwater monitoring programs emulate those required of RCRA-regulated facilities.

Alternatively, NORM wastes may be disposed of by transfer to a facility licensed by a state to receive such wastes. One such facility, Envirocare of Utah,[1] is licensed and permitted to accept relatively low concentrations of NORM and other low-concentration AEA-regulated mixed wastes for land disposal. To be eligible for disposal, a waste cannot exceed 2,000 picocuries per gram (pCi/g) of total NORM activity. Similarly, wastes containing up to 360 pCi/g of ^{60}Co and 560 pCi/g of ^{137}Cs[2] may be received under this Agreement State license. Eligible waste for this facility is typically contaminated soil and debris. Because NORM is not regulated under either the AEA or RCRA, provision for adequate disposal capacity of this type of radioactive waste is not mandated under the LLRWPAA or Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Consequently, NORM wastes are not featured in this study.

1.5 Organization of This Report

This report updates the original report, *Mixed Waste Management Options* (DOE/LLW-134). It is divided into two parts: a relatively short narrative and a more voluminous part containing three appendices. The first part begins with an introductory section explaining the history and scope of the report. Section 2 provides a brief description of the regulatory requirements for mixed waste management. Section 3 contains an overview of generated and stored mixed waste. Section 4 describes the various options available for managing mixed waste, including options that avoid generating mixed waste altogether. Section 5 develops a management strategy for each of the mixed waste streams and identifies each of those individual wastes that are likely not treatable. Section 6 summarizes the findings of the first part of the report, and Section 7 provides references.

The second and largest part of this report consists of three appendices. Appendix A and Appendix B list the individual mixed wastes that were generated and stored as of December 31, 1990, respectively. Appendix C contains copies of waste acceptance criteria for commercially available treatment facilities.

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1. Mention of a commercial product or firm does not constitute endorsement of that product or firm by the Department of Energy or any of its contracting firms.

2. Personal communication with Susan Rice, Envirocare of Utah, May 8, 1991.

2. OVERVIEW OF MIXED WASTE REGULATORY REQUIREMENTS

An understanding of the regulatory framework of AEA and RCRA is required for generators to evaluate their mixed waste disposal options. This section provides a description of the regulatory programs governing radioactive and hazardous waste management.

2.1 Radioactive Waste Management

The NRC is responsible for licensing and regulating the receipt, use, transfer, possession, and disposal of byproduct, source, and special nuclear material, and for conducting research in support of the licensing and regulatory process. The NRC has four regional offices: King of Prussia, Pennsylvania; Atlanta, Georgia; Lisle, Illinois; and Arlington, Texas. Twenty-nine states are allowed by agreement with the NRC to regulate most commercial radioactive material practices. The 29 "Agreement States" are as follows:

> Alabama, Arizona, Arkansas, California, Colorado, Florida, Georgia, Illinois, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Mississippi, Nebraska, Nevada, New Hampshire, New Mexico, New York, North Carolina, North Dakota, Oregon, Rhode Island, South Carolina, Tennessee, Texas, Utah, and Washington.

Two-thirds of all commercial license applications are received and processed through the Agreement States. The remaining one-third are received and processed through the NRC regional offices.[3]

The NRC maintains sole authority for regulating production and utilization facilities, such as commercial nuclear power plants, and several other practices reserved for sole NRC jurisdiction (Office of Technology Assessment, 1989). The Agreement States have the authority to regulate most other commercial practices involving radioactive materials, including waste management practices.

The LLRWPAA has defined low-level radioactive waste (LLW) as waste containing source, special nuclear, or byproduct material that is not classified as high-level radioactive waste, spent nuclear fuel, or byproduct material as defined in Section 11e(2) of the AEA. An NRC or Agreement State license is required to receive, possess, and dispose of wastes containing source, byproduct, or special nuclear material. Licensing requirements for manufacturing, producing, transferring, receiving, acquiring, owning, possessing, or using byproduct, source, and special nuclear material are discussed in 10 CFR Parts 30 through 33, 40, and 70. These regulations discuss the following:

- Rules of General Applicability to Domestic Licensing of Byproduct Material (10 CFR 30)
- General Domestic Licenses for Byproduct Material (10 CFR 31)

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3. Personal communication with Michael LaMaster, Office of Nuclear Materials Safety and Safeguards, U.S. Nuclear Regulatory Commission Headquarters, Rockville, Maryland, December 7, 1994.

- Specific Domestic Licenses to Manufacture or Transfer Certain Items Containing Byproduct Material (10 CFR 32)
- Specific Domestic Licenses of Broad Scope for Byproduct Material (10 CFR 33)
- Domestic Licensing of Source Material (10 CFR 40)
- Domestic Licensing of Special Nuclear Material (10 CFR 70).

Regulations governing land disposal of LLW are contained in 10 CFR 61; health protection standards are given in 10 CFR 20; low-level radioactive waste manifesting and reporting requirements are found in 10 CFR 20, Appendix F; and transportation requirements are given in 10 CFR 71.

Classification of Low-Level Radioactive Waste—Classification of LLW is described in 10 CFR 61.55 and involves consideration of both long-lived radionuclides and short-lived radionuclides. Classification of the waste is determined according to allowable concentrations of radionuclides as specified in 10 CFR 61.55.

Three classifications of waste are established in 10 CFR 61: Class A, B, and C. Class A waste is usually segregated from the other waste classes and meets the minimum waste form criteria. Class B waste must meet more rigorous requirements for waste form to ensure structural stability after disposal. Class C waste must not only meet the more rigorous waste form requirements but also must be disposed of in a manner that protects against inadvertent intrusion. Those low-level radioactive wastes that have concentrations greater-than-Class C (GTCC) limits are not generally suitable for near-surface disposal. Disposal of GTCC wastes is a responsibility of the Federal government.

Waste Form Requirements—The following waste characteristics are the minimum requirements under 10 CFR 61.56:

- Waste must not be packaged in cardboard or fiberboard boxes
- Liquid wastes must be solidified or packaged in absorbent material that absorbs twice the volume of the liquid
- Solid waste shall not contain liquid in quantities greater than 1% volume
- Waste must not be capable of detonation or explosion
- Waste must not contain or be capable of generating toxic gases, vapors, or fumes harmful to workers
- Waste must not be pyrophoric
- Gaseous waste must be packaged at a pressure not exceeding 1.5 atmospheres at 20°C
- Waste containing hazardous, biological, pathogenic, or infectious material must be treated to reduce hazards.

Additionally, Class B and Class C waste must meet structural stability requirements. A structurally stable waste is one that will maintain its physical dimensions and identity for 300 years under the expected disposal conditions (e.g., compaction, overburden, moisture). Structural stability can be provided by the waste form itself, through processing such as solidification, or by placing the waste in a stable container or structure. Void spaces within or surrounding the waste must also be reduced to the maximum extent practicable.

Generator and Transportation Requirements—Generators of LLW must meet the requirements in 10 CFR 71 for packaging, preparation for shipment, and transportation of licensed material. Packaging and transport of licensed material are also subject to the requirements set forth in 10 CFR Parts 20, 21, 30, 40, 70, and 73 and to the regulations of the U.S. Department of Transportation (DOT). The transportation regulations of 10 CFR 71 apply to transport of material outside the confines of the licensee's "authorized place of use." The information required in a shipping manifest for radioactive waste is specified in 10 CFR 20 Appendix F and 49 CFR 173.

Licensing of Low-Level Radioactive Waste Disposal Facilities—NRC regulations governing the disposal of mixed waste are contained in 10 CFR 61 and address the following:

- Performance objectives for the operation of commercial LLW disposal facilities
- Technical requirements for the siting, design, operation, closure, and post-closure activities of LLW disposal facilities
- Technical requirements for waste stability
- Criteria for waste acceptance
- Criteria for the classification of LLW
- Administrative and procedural requirements for licensing disposal facilities
- Administrative requirements for closure, institutional control, and long-term care
- Provisions for adequate financial assurance.

Under 10 CFR 61, an application for a license must contain general, technical, institutional, financial, security, and other information.

2.2 Hazardous Waste Management

A notice issued July 3, 1986, (51 FR 24504), states that EPA and its authorized states will regulate the hazardous component of a mixed waste management stream through their RCRA programs. This notice was issued to clarify EPA's interpretation of RCRA Section 1004(27), which excludes "source, special nuclear, and byproduct material" from regulation under RCRA. EPA interpreted this exclusion to be specific only to the radioactive component of mixed waste. The definition of mixed waste was recently added to RCRA by the FFCA of 1992. Mixed wastes are a subset of hazardous wastes, and as such, are subject to the land disposal restrictions in 40 CFR 268.

This section presents the basic framework of the RCRA program and illustrates how EPA intends to apply these standards at mixed waste management facilities.

EPA regulations governing the implementation of the RCRA program are given in 40 CFR Parts 124, 260 through 266, 268, and 270. These regulations provide the following:

- Procedures for Decision Making (40 CFR 124)
- Hazardous Waste Management System: General (40 CFR 260)
- Identification and Listing of Hazardous Waste (40 CFR 261)
- Standards Applicable to Generators of Hazardous Wastes (40 CFR 262)
- Standards Applicable to Transporters of Hazardous Waste (40 CFR 263)
- Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (40 CFR 264)
- Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (40 CFR 265)
- Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities (40 CFR 266)
- Land Disposal Restrictions (40 CFR 268)
- EPA-Administered Permit Programs: The Hazardous Waste Permit Program (40 CFR 270).

EPA has also published standards for Federal authorizations of state programs (40 CFR 271).

Identification of Hazardous Waste—Regulations given in 40 CFR 260 and 261 provide guidance to the regulated community and authorized state representatives on the definitions of solid and hazardous waste. The regulatory definition of hazardous waste is derived from Congress' definition in RCRA Section 1004(5), which states that hazardous waste:

- Causes, or significantly contributes to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness
- Poses a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed.

Under RCRA, hazardous waste is a subset of solid waste [RCRA Section 1004(27)]. In RCRA Section 3001(a), Congress directs EPA to develop and promulgate criteria to identify characteristics of hazardous waste and to list wastes to be regulated. In developing these criteria, EPA had to consider the toxicity, persistence, biodegradability, and potential for bioaccumulation of waste material.

EPA developed and published these criteria in 40 CFR 261, Subpart C (characteristic wastes) and Subpart D (listed wastes) (45 FR 33063, May 19, 1980). Subpart C provides the basis for determining if wastes are corrosive, ignitable, reactive, or toxic. The toxic characteristic (TC) under Subpart C is actually determined through application of a leach test, which models whether leachate from disposed waste would contain specified components above levels considered hazardous. Subpart D lists over 450 wastes from various specific and nonspecific sources. EPA also considers mixtures of listed hazardous waste or characteristic hazardous waste, which still exhibit hazardous characteristics, to be hazardous waste. Residue from the treatment of listed hazardous waste was also considered hazardous waste.

Hazardous Waste Generator and Transporter Requirements—Generators of hazardous waste are required by 40 CFR 262 to obtain an EPA identification number and to "manifest" all offsite shipments using an EPA-specified reporting form [EPA Form 8700-22 (Rev. 9-86)] and hazardous waste codes. Transporters are required to comply with manifest and recordkeeping specifications of 40 CFR 263. These regulations incorporate and are consistent with DOT regulations in 49 CFR Subchapter C. Transportation regulations of 40 CFR 263 do not need to be met for onsite shipments of hazardous wastes. Generators storing wastes for longer than 90 days must obtain a RCRA permit.

Technical Standards for Permitting of Hazardous Waste Facilities—An owner or operator of a treatment, storage, and disposal (TSD) facility regulated by EPA is required to obtain a permit to handle hazardous waste under 40 CFR 264. General facility standards, requirements for preparedness and prevention, contingency planning and emergency response, manifest system and reporting provisions, corrective action compliance, closure and post-closure care, and financial assurance provisions are sections of 40 CFR 264 that apply to all TSD operators.

Facilities in authorized states would be subject to state requirements, which can be more stringent and of greater scope than their Federal counterparts. Existing TSD operators who qualified for interim status (under the provisions of 40 CFR 270.70) are subject to 40 CFR 265 regulations once their Part A permit applications were submitted. The interim status regulations match the format of the 40 CFR 264 regulations except for minor modifications. Once permitted, owner/operators must comply with the terms and conditions of the final permit, plus any newly effective Hazardous and Solid Waste Amendments (HSWA) requirements. Final permit conditions are based on 40 CFR 264 requirements.

While preliminary designs for mixed waste disposal facilities are typically engineered structures, EPA can be expected to evaluate such a structure as a landfill or as a miscellaneous unit drawing heavily on landfill requirements. Currently, there is only one facility, Envirocare of Utah, Inc., that provides disposal capacity for certain types of commercially generated mixed waste. Envirocare accepts mainly low activity and high volume mixed wastes.

Regulations under 40 CFR 266 are for owners and operators of specific types of facilities such as energy recovery or precious metals recovery.

The Land Disposal Restrictions—The land disposal restrictions (LDRs) establish treatment standards prescribing how hazardous wastes must be treated before they can be disposed in or on the land. A treatment standard may specify a concentration threshold that can be attained by one or more technologies or it may require the waste be treated using one particular technology. Treatment standards are based upon performance characteristics of the

best demonstrated available technology (BDAT) for specific waste components. Consequently, two different treatment concentrations and BDATs may be listed depending on the nature of the waste (wastewater or nonwastewater).

Historically, EPA issued treatment standards according to waste codes. Under this approach, some waste codes carried different treatment standards for the same constituent. To address these inconsistencies, on September 19, 1994, (59 FR 47982), EPA announced the concept of "universal treatment standards." Under this scheme, the same standard applies to a constituent regardless of the source of the waste. Thus, many treatment standards have been replaced with a universal treatment standard.

Under the concept of universal treatment standards, the underlying hazardous constituents for certain toxicity characteristic organic wastes (D018 to D043) must also be treated to the specified universal treatment standards for that constituent. EPA has, however, established a 2-year National capacity variance under which radioactive mixed wastes containing newly listed hazardous wastes (K141 to K145 and K147 to K151) or these toxicity characteristic wastes (including soil and debris) are not subject to the applicable treatment standards until September 19, 1996.

As a consequence of the LDR rules, generators of hazardous waste are responsible for ensuring adequate treatment of manifested wastes before shipment to a land disposal facility. Under penalty of enforcement action, owner/operators of disposal facilities must include testing frequencies and protocols to verify compliance with the LDRs. Owner/operators may not accept wastes that exceed the LDRs unless they have onsite capabilities for treating the wastes to meet required standards or the wastes have been exempted under 40 CFR 268.5 (extension), 268.6 (no migration variance), or 268.44 (treatability variance).

EPA has issued LDR standards for spent solvents and dioxins, "California list" wastes, underground injection activities, first-third wastes, second-third wastes, third-third wastes, and debris contaminated with hazardous waste constituents. Although mixed wastes are subject to LDRs, EPA recognized that there is little or no commercial capacity available to accept mixed wastes. To address this problem, EPA issued a policy announcing that the agency will not enforce the storage prohibition on mixed wastes for generators who produce less than 1,000 cubic feet per year of mixed wastes (51 FR 40572, August 29, 1991). This policy, however, is predicated on facilities managing their mixed waste in an environmentally responsible manner. According to EPA, the nonenforcement policy should cover most of the regulated community, as EPA estimates that there are typically only two 55-gallon drums or less of mixed waste generated per year per facility (59 FR 18813, April 20, 1994). The nonenforcement policy will remain in force until April 20, 1996, subject to further extensions (59 FR 18815, April 20, 1994).

Permitting of Hazardous Waste Management Facilities—Regulations given in 40 CFR 270 provide generators and state and Federal reviewers the basic requirements for developing, submitting, and reviewing a permit application. A RCRA permit application consists of two parts, Part A (40 CFR 270.13) and Part B (40 CFR 270.14, and applicable sections of 270.15 through 270.29). Part A consists of Forms 1 and 3 of the Consolidated Permit Application Forms. Part A provides information on the general facility, the owner/operator, and types and quantities of hazardous wastes handled at the facility.

A Part B permit application is required by EPA or an authorized state to determine compliance with the 40 CFR 264 technical standards. Programs for executing extensive

groundwater monitoring requirements, recordkeeping and reporting, and inspection requirements must be outlined in the Part B application. A closure and post-closure care plan, a preparedness and prevention plan, a contingency plan, and an exposure information report should also be included in the submittal. A waste analysis plan is also an important part of the Part B application for a mixed waste disposal facility, since detailed analysis of waste can increase radiation exposures. Certain technical data such as design drawings and specifications, and engineering studies must be certified by a registered professional engineer. Additional information on permitting and licensing requirements can be found in DOE's *Mixed Waste Disposal Facility Implementation Plan* (U.S. Department of Energy, 1990).

Federal Facilities Compliance Act—The FFCA was signed into law on October 6, 1992, (P.L. 102-386). Under the FFCA, the DOE is immune from RCRA enforcement actions for violating the storage prohibition until October 6, 1995, as long as the wastes are managed in compliance with all other applicable requirements and an existing permit, agreement, or administrative/judicial order does not apply to the waste. Indefinite storage may be allowed if DOE prepares inventories of mixed wastes being stored at each facility and submits plans for developing mixed waste treatment capacity and technology. The mixed waste inventories were summarized in the *Interim National Inventory of DOE Mixed Wastes and Treatment Technologies and Capacities* issued by the DOE on April 21, 1993. If not in compliance with an approved plan, DOE facilities could face fines and penalties from the state or EPA after October 1995.

3. COMMERCIALLY GENERATED MIXED WASTE STREAMS

Under Phase 1 of the project, existing and representative data on mixed waste were evaluated to determine the type of waste requiring treatment. Outlined below is a discussion of the waste characterization methodology employed, treatment requirements for mixed waste, and descriptions of the categories of mixed waste that resulted from the evaluation.

3.1 Waste Characterization

Since mixed waste is subject to treatment requirements originating under the AEA and RCRA, it is necessary to characterize both the radioactive and hazardous components of the mixed waste.

As discussed in Section 1, the most recent and comprehensive estimate of the Nation's mixed waste storage and generation patterns was conducted jointly by the NRC and the EPA and published in a document herein called the National Profile (Klein et al., 1992). For development of the information, the NRC and EPA sent a questionnaire to representative and randomly selected licensees of either the NRC or an Agreement State who were likely to generate mixed waste. Responses were received from 1,016 generators who completed the mail-in survey form and returned it for data entry and processing. Consequently, the data in the National Profile rely heavily on the generators' abilities to both recognize the generation of mixed waste and to properly characterize that waste. It is important to note that the National Profile did not specifically attempt to address cleanup wastes from remedial action activities. If this type of waste was identified by a generator, the information was included as part of the results of the National Profile.

The National Profile applied a statistically derived weighting factor to reported volumes to approximate national conditions. The National Profile was designed to accurately describe the Nation's commercial mixed waste within a factor of 2 (with 95% confidence limits). This same factor of 2 also applies to mixed waste generated within the various categories of generator, i.e., nuclear utilities, medical, academic, industrial, and governmental facilities. Because of the limited number of generators surveyed in each state and compact region, estimates of mixed waste cannot be reliably extracted with the same confidence for individual states or compact regions.

This report uses data obtained from the National Profile to reevaluate and assess whether the mixed waste has an available treatment option. To perform this evaluation, data from the National Profile were grouped according to the description of the waste provided by the generators. Since collection of that data, the hazardous waste regulations have been revised to include organic wastes as characteristic wastes, establish treatment standards for newly identified wastes and wastewaters, and establish universal treatment standards for underlying hazardous constituents. These additional standards confound prediction of mixed waste treatment, since information on characteristic organics and underlying hazards in the wastes was not collected during the original survey.

For this analysis, the following assumptions are made:

- The data in the survey are correct; the waste is correctly characterized by the generator.

- If a waste is identified as being aqueous, it is assumed to be mostly water. If the waste is identified as a bulk liquid, it is assumed to be mostly composed of the identified components.

- If there is an ambiguity as to waste classification, it is assumed to be the more-difficult-to-treat waste option.

- If there was no activity or volume reported, it is assumed that the activity or volume would not be a discriminator in the management of the waste.

3.2 Treatment Requirements

Treatment requirements for the radioactive component of the waste depend on a knowledge of the radionuclide, its concentration in the waste, and the physical form of the waste. The concentration of the radionuclides determines the class of the waste (Class A, B, or C), whereas the physical form of the waste determines any special handling or packaging requirements.

Treatment requirements for RCRA-regulated waste depend on EPA-designated waste codes and whether the waste is a wastewater or nonwastewater. Classification of hazardous waste goes beyond merely identifying the chemicals that were used to generate the waste; it also involves a knowledge of the industry or process generating the waste, as well as the physical form of the waste. Review and analysis of past surveys demonstrated that identification of hazardous waste codes is difficult.

Once the waste is classified by waste code (hazardous component), physical form, and waste class (radioactive component), the mandated treatment for each waste can be identified in 40 CFR 268. The minimum waste form requirements for radioactive waste are specified in 10 CFR 61.56. Those requirements must be met, or exceeded, for all radioactive wastes. If the waste is classified as Class B or Class C, the waste must also meet the waste form stability requirements; that is, the waste must be capable of retaining its physical form for at least 300 years. Compliance with the stability requirements is optional for Class A waste under NRC requirements.

Determining the required treatment for the hazardous waste component is more complicated, as each waste code and waste form has a treatment technology or concentration specified in 40 CFR 268. Those treatments were established to substantially diminish the toxicity of the waste, yield a waste that was no longer characteristically hazardous, or yield a waste that was treated with the best demonstrated available technology. In establishing its treatment requirements for most low-level radioactive mixed wastes, EPA requires the same treatment standards as for nonradioactive hazardous waste. A distinction was made only for those mixed wastes clearly posing a large external radiation hazard (e.g., high-level radioactive waste), or unique treatment problems (e.g., contaminated lead solids and mercury). For the many other types of mixed waste generated, EPA stated that it lacked sufficient information to establish treatment standards for mixed waste that were different from those for nonradioactive hazardous waste. With knowledge of the waste code, whether the waste is a wastewater or a nonwastewater, and the concentration of the hazardous component in the waste (in some circumstances), the treatment required under 40 CFR 268 can be determined.

3.3 Waste Descriptions

Each waste reported in the National Profile was reviewed and classified by its hazardous waste category and physical form. Table 3-1 presents a tabulation of the mixed wastes that were generated in 1990 and the reported volume of each of the wastes. Table 3-2 presents a tabulation based on the activity reported for each of the wastes. Tables 3-3 and 3-4 provide similar tabulations for volume and activity of wastes that were reported as "in storage" on December 31, 1990. For several wastes, there was no volume or activity reported by the generator.

While there were weighting factors applied to the volume of the waste, there was no similar weighting factor applied to the activity. Consequently, activity of the waste may be under-reported.

Detailed tabulations of all individual waste streams generated in 1990 are located in Appendices A-1 through A-15. Wastes that were in storage on December 31, 1990, are listed in Appendices B-1 through B-16. The wastes outlined in the tables and appendices are grouped based on their chemical characteristics as described in the following subsections.

3.3.1 Ignitable Waste

Ignitable wastes were identified by generators as D001 wastes and not further identified as liquid scintillation fluids, vials, or cocktail. The majority of the ignitable wastes were in the form of a liquid or bulk liquid. Ignitable wastes have a flashpoint of less than 140°F. As listed in Appendices A-1 (generated waste) and B-1 (stored waste), waste streams having the characteristic of ignitability include formaldehyde, methanol, ethanol, petroleum distillate, tetrahydrofuran, acetonitrile, acetone, methyl ethyl ketone, isopropanol, coal tars, naphthalene, CIS-2-pentene, ignitable adhesives, and paint waste. This waste is generated by all facility types including academia, government, nuclear utilities, and industry.

3.3.2 Corrosive Waste

Corrosive wastes are defined as those aqueous wastes having a pH of less than or equal to 2 or greater than or equal to 12.5. Alternatively, a liquid waste that corrodes steel at a rate greater than 6.35 mm at specified test conditions is also a corrosive waste. Appendices A-2 (generated waste) and B-2 (stored waste) list all the wastes in the National Profile that were identified as having the sole characteristic of corrosivity. It should be noted that some of these wastes are solid materials. Because the definition of corrosivity in 40 CFR 261.22 pertains only to liquids, such materials should not be a characteristic waste. Nonetheless, the solid corrosive wastes were identified as being generated. It was assumed that commercial treatment was available for these wastes.

3.3.3 Biological Waste

The biological waste category was included in this study because the waste was identified in the National Profile as a mixed waste generated in 1990, as summarized in Appendix A-3. It is not readily apparent, from the descriptions of the waste and generating processes, why these wastes were included as mixed wastes. Consequently, biological wastes are assumed to be treatable by currently available means, and none require further management as a mixed waste under RCRA.

Table 3-1. Summary of waste volumes generated in 1990 by hazardous constituent group and physical form.

Waste	*Weighted Volume in cubic meters before treatment*						***Total Volume***	***Percent Volume***
	Aqueous	*Liquid, n.o.s.*	*Absorbed Liquid*	*Solid, n.o.s.*	*Trash*	*Unknown a/*		
Ignitable	0.43	66.95	0.40	0.49	0.42		68.69	1.96
Corrosive		36.98		42.10			79.08	2.26
Biological		1.40	0.25	3.56			5.21	0.15
Reactive		0.21		12.75	0.38		13.34	0.38
Characteristic Metals	18.09	2.07	1.61	234.05	3.09	24.67	258.91	7.41
Characteristic Organics		36.67	0.04	1.52			38.23	1.09
F001 & F002	9.45	37.82		52.45			99.72	2.85
F003	0.10	48.91	0.37		0.53		49.91	1.43
F005		129.42	1.40	7.99	5.33		144.14	4.12
P & U Listed	0.02	4.07	8.01	0.56	3.44		16.10	0.46
Oils	0.79	141.73	1.77			4.89	144.29	4.13
Other Organics		5.98		0.03		24.96	6.01	0.17
LSC	313.67	1,985.00	36.29	10.35		312.98	2,345.31	67.08
Multi-Code Waste	3.36	111.91	0.08	0.60	73.28	0.00	189.23	5.41
Miscellaneous			0.17	2.43	35.37	0.36	37.97	1.09
TOTAL VOLUME	345.91	2,609.12	50.39	368.88	121.84	367.86	3,496.14	
Percentage Volume	9.89	74.63	1.44	10.55	3.48			

a/ Volumes of hazardous constituents for which the physical forms are not known are shown in this table. However, these volumes have not been included in the total volume and percent volume calculations.
n.o.s. = not otherwise specified

Table 3-2. Summary of waste activity generated in 1990 by hazardous constituent group and physical form.

	Activity in mCi before treatment							
Waste	*Aqueous*	*Liquid, n.o.s.*	*Absorbed Liquid*	*Solid, n.o.s.*	*Trash*	*Unknown a/*	***Total Activity***	***Percent Activity***
Ignitable	1.00	1,513.02	0.20	0.06	0.01		1,514.29	0.59
Corrosive		105.07		60.50			165.57	0.06
Biological		50.00	0.00	176.44			226.44	0.09
Reactive		7.13		1.00	0.10		8.23	0.00
Characteristic Metals	1.56	6.02	52.39	88,842.90	2.81	0.00	88,905.68	34.47
Characteristic Organics		48,769.20	15.00	31.00			48,815.20	18.93
F001 & F002	25,000.00	169.24		118.42			25,287.66	9.80
F003	1,982.00	3,308.48	100.00		2.00		5,392.48	2.09
F005		47,709.09	10.81	0.00	3.88		47,723.78	18.50
P & U Listed	0.00	89.71	9.00	6,000.00	2.49		6,101.20	2.37
Oils	30.00	18.03	0.00			0.00	48.03	0.02
Other Organics		151.06		0.00		0.00	151.06	0.06
LSC	259.95	15,796.50	152.67	14.19		310.17	16,223.31	6.29
Multi-Code Waste	0.00	13,805.66	3,173.35	41.94	1.30	0.00	17,022.25	6.60
Miscellaneous			34.00	200.01	92.00	0.00	326.01	0.13
TOTAL ACTIVITY	27,274.51	131,498.21	3,547.42	95,486.46	104.59	310.17	257,911.19	
Percentage Activity	10.58	50.99	1.38	37.02	0.04			

a/ Volumes of hazardous constituents for which the physical forms are not known are shown in this table. However, these volumes have not been included in the total volume and percent volume calculations.
n.o.s. = not otherwise specified

Table 3-3. Summary of waste volumes in storage as of December 31, 1990 by hazardous constituent group and physical form.

	Weighted Volume in cubic meters before treatment							
Waste	*Aqueous*	*Liquid, n.o.s.*	*Absorbed Liquid*	*Solid, n.o.s.*	*Trash*	*Unknown a/*	***Total Volume***	***Percent Volume***
Ignitable	1.02	48.34	0.38	1.18			50.92	3.78
Corrosive	3.94	4.62	1.26	3.47			13.29	0.99
Biological							0.00	0.00
Reactive		0.21		73.50			73.71	5.48
Characteristic Metals	5.87	1.10	1.83	256.28	2.05		267.13	19.84
Characteristic Organics		1.87	0.10				1.97	0.15
F001 & F002	58.80	140.83		71.48		0.65	271.11	20.14
F003	0.29	6.21		1.74	1.10		9.34	0.69
F005		3.18	9.93	14.17	1.10		28.38	2.11
P & U Listed		3.17	0.07	1.67	3.42		8.33	0.62
Oils		92.70	0.47			3.08	93.17	6.92
Other Organics		0.44			0.18	1.20	0.62	0.05
LSC	92.52	245.97	5.66	5.95		1.69	350.10	26.01
Multi-Code Waste	0.02	84.54	1.73	2.17	3.59		92.05	6.84
Miscellaneous	21.40	22.33	17.07	8.12	7.53	1.40	76.45	5.68
Dioxin		0.04			2.79		2.83	0.21
Paint Waste		4.14		2.57			6.71	0.50
TOTAL VOLUME	183.86	659.69	38.50	442.30	21.76	8.02	1,346.11	
Percentage Volume	13.66	49.01	2.86	32.86	1.62			

a/ Volumes of hazardous constituents for which the physical forms are not known are shown in this table. However, these volumes have not been included in the total volume and percent volume calculations.
n.o.s. = not otherwise specified

Table 3-4. Summary of waste activity in storage as of December 31, 1990 by hazardous constituent group and physical form.

	Activity in mCi before treatment							
Waste	*Aqueous*	*Liquid, n.o.s.*	*Absorbed Liquid*	*Solid, n.o.s.*	*Trash*	*Unknown a/*	***Total Activity***	***Percent Activity***
Ignitable	1.73	112.37	0.41	0.04			114.55	0.03
Corrosive	16.11	17.09	60.00	0.00			93.20	0.02
Biological							0.00	0.00
Reactive		0.03		262.78			262.81	0.06
Characteristic Metals	4.10	1.14	2.00	87,560.95	0.22		87,568.41	20.07
Characteristic Organics		3,349.56	0.00				3,349.56	0.77
F001 & F002	1.05	735.30		223.71		0.00	960.06	0.22
F003	4,624.90	114.77		0.00	27.00		4,766.67	1.09
F005		16.00	50.40	0.00	0.00		66.40	0.02
P & U Listed		166.22	0.35	6,000.01	6.99		6,173.57	1.41
Oils		191.81	0.00			0.00	191.81	0.04
Other Organics		102.35			0.00	0.00	102.35	0.02
LSC	117.63	5,340.37	0.54	12.10		0.00	5,470.64	1.25
Multi-Code Waste	0.00	45,575.27	3,375.00	3.64	3.92		48,957.83	11.22
Miscellaneous	1.50	275,100.68	0.68	3,150.00	10.00	15.00	278,262.86	63.77
Dioxin		1.95			2.02		3.97	0.00
Paint Waste		0.03		0.12			0.15	0.00
TOTAL ACTIVITY	4,767.02	330,824.94	3,489.38	97,213.35	50.15	15.00	436,344.84	
Percentage Activity	1.09	75.82	0.80	22.28	0.01			

a/ Activity of hazardous constituents for which the physical forms are not known are shown in this table. However, these activities have not been included in the total activity and percent activity calculations.
n.o.s. = not otherwise specified

3.3.4 Reactive Waste

Reactive wastes (a) are normally unstable and readily undergo violent change without detonating, or (b) react violently with water, or (c) form potentially explosive mixtures with water, or (d) when mixed with water generate toxic gases, vapors, or fumes in sufficient quantity to be dangerous to human health or the environment, or (e) are cyanide or sulfide bearing wastes which under specified conditions are dangerous to human health or the environment, or (f) are capable of detonation or explosive reaction if subjected to a strong initiating source or heated under confinement, or (g) are readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure, or (h) are forbidden, Class A, or Class B explosives as defined by DOT regulations.

Reactive wastes identified in the National Profile are listed in Appendices A-4 (generated waste) and B-3 (stored waste). Academic institutions and industry generated all the reactive waste identified in the National Profile. It is the smallest category of mixed waste generation by volume and activity. However, reactive wastes have the largest percentage of waste streams that are untreatable. Since relatively small volumes of reactive waste exist, it is unreasonable to expect that commercial treatment facilities will develop customized treatments for these wastes at reasonable cost. Therefore, generators of reactive wastes may need to obtain treatment permits for custom management of these low-volume wastes that will satisfy the 40 CFR 268 requirements for DEACT (deactivation) to remove the reactive characteristic.

3.3.5 Characteristic Metals

Characteristic metal wastes are generated by academic institutions, industry, nuclear utilities, government, and medical facilities. This waste category is dominated by lead and lead shielding, mercury, cadmium, and chromium, as shown in Appendices A-5 (generated waste) and B-4 (stored waste).

3.3.6 Characteristic Organic Wastes

Typical characteristic organic wastes were identified as chloroform, methanol, and pesticides as listed in Appendices A-6 (generated waste) and B-5 (stored waste). Academic institutions, industry, and government were identified as generators of this type of waste. Some waste streams exhibiting both the characteristic of ignitability and toxicity were also identified as characteristic organic waste. Detailed descriptions of hazardous components were inconsistent in some instances with the EPA waste code identified for this waste. For example, waste codes D022 (chloroform) and D001 (ignitability) were assigned to a waste stream identified as "organic solvents." In these cases, the waste was classified according to the waste code.

3.3.7 F001 and F002 Wastes (Spent Halogenated Solvents)

F001 and F002 wastes have generally the same chemical constituents, although their solvent uses differ. They are listed wastes, and when managed as something other than a fuel substitute, their residues retain their listed hazardous waste designation. While a portion of these wastes is generated by industry, government, and academia, most of the F001 and F002 wastes are generated by nuclear utilities where they are used for general degreasing and cleaning of contaminated reactor components. In recent years, however, nuclear utilities have phased out their usage. F001 and F002 wastes are listed in Appendices A-7 (generated waste) and B-6 (stored waste).

3.3.8 F003 Wastes (Nonhalogenated Spent Solvents)

F003 wastes that were not identified as liquid scintillation cocktail wastes are listed in Appendices A-8 (generated waste) and B-7 (stored waste). Generators include industry, nuclear utilities, academic institutions, government, and medical facilities. F003 wastes are certain nonhalogenated solvents that are listed because they are ignitable. These solvents include xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, and methanol.

3.3.9 F005 Wastes (Nonhalogenated Spent Solvents)

F005 wastes that were not identified as LSC wastes are listed in Appendices A-9 (generated waste) and B-8 (stored waste). Generators include industry, nuclear utilities, government, and academic institutions. F005 wastes include the following nonhalogenated spent solvents: toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxyethanol, and 2-nitropropane.

3.3.10 P- and U-Listed Wastes

P- and U-listed wastes are unused commercial chemical products that can no longer be used for their intended purpose, are off-specification, are the sole active ingredient in a chemical formulation, or are chemical intermediaries. Characterization of P- and U-listed wastes requires in-depth knowledge of the processes generating the waste. Upon close scrutiny, it is likely that some of these identified as P- or U-listed wastes may actually be characteristic or unregulated wastes. As stated previously, the generators' designation of those wastes identified in Appendices A-10 (generated waste) and B-9 (stored waste) is assumed to be correct. Industry, academic institutions, nuclear utilities, and government are identified as generating P- and U-listed wastes. As with other listed wastes, if treatment is by some means other than fuel substitution, treatment residues from this waste must be managed as a P- or U-listed hazardous waste.

3.3.11 Oil Waste

States can regulate additional wastes as hazardous that the EPA does not regulate as hazardous waste. Many of these oil wastes are examples of these "state-only" hazardous wastes. Oils that are not recycled can be Federally regulated as well. Industry, nuclear utilities, government, and academia generate radioactively contaminated oils that are managed as hazardous waste. Nuclear utilities generate most of these wastes, as shown in Appendices A-11 (generated waste) and B-10 (stored waste).

3.3.12 Other Organic Waste

For many organic wastes, there was insufficient information to classify the waste as either a listed or a characteristic organic waste. Because of similar generating processes and waste description, an estimate of treatment availability was made. Those organic wastes having

incomplete waste code descriptions are listed in Appendices A-12 (generated waste) and B-11 (stored waste).[4]

3.3.13 Liquid Scintillation Cocktail (LSC) Waste

Liquid scintillation counting fluids is the largest grouping of mixed wastes. They are listed in Appendices A-13 (generated waste) and B-12 (stored waste). LSC wastes are generated by every generator group in numerous applications such as diagnostic testing, research, and radiation protection monitoring. LSC fluids typically contain toluene, xylene, and, occasionally, benzene or pseudocumene. The organic liquid is used for its solvent and energy transmitting properties to dissolve a small amount of chemical fluor and provide a uniform counting solution. When a radioactive disintegration occurs in the solution, the fluor absorbs a proportion of the energy, giving off light. The amount of light emitted is therefore proportional to the amount and energy of the radioactivity. LSC techniques are most often used to measure low-energy beta particles such as those emitted by ^{3}H and ^{14}C. LSC techniques can also be used for other radiation detection applications as well.

LSC fluid wastes can be disposed of without regard to the radioactive component of the waste if they contain only ^{3}H or ^{14}C with a total concentration of 0.05 microcurie per gram of scintillation liquid according to 10 CFR 20.2005. In those cases where radionuclides other than ^{3}H or ^{14}C are present in the fluid, this exemption may not apply. If the concentrations of allowable nuclides exceed 0.05 microcurie per gram, waste aggregation is usually employed to reduce the concentration below the exempt or allowable level. LSC wastes are usually designated by EPA waste codes F003 (xylene), F005 (benzene or toluene), or D001, ignitability (dioxane or pseudocumene).[5]

More recent advances in counting technology have resulted in the substitution of "aqueous" or "biodegradable" proprietary compounds for the more hazardous RCRA-regulated substances. Consequently, less LSC waste requires management as a RCRA-regulated hazardous waste.

3.3.14 Multi-EPA Waste Code Waste

Often, a waste requires more than one waste code to describe its hazardous nature. For example, an F-listed solvent may also exhibit toxicity characteristic for metals such as lead. These wastes may require special treatment for each of their hazards. Consequently, they have been

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4. One of these waste streams was identified as having EPA waste code "F024." This waste code is for a "process waste, including but not limited to, distillation residues, heavy ends, tars, and reactor clean-out wastes, from the production of certain chlorinated aliphatic hydrocarbons by free radical catalyzed processes." Since the waste was generated by a medical facility, it is likely mischaracterized. It is included with the Other Organic Wastes, since it is also described as having chloroform as its hazardous component.

5. One of the more than 450 LSC waste streams was identified as being Class C for radioactivity. This designation is not reasonable because the nature of LSC requires relatively low concentrations to obtain credible results, and the average concentration of ^{14}C, ^{3}H, ^{35}S, and ^{32}P reported for this waste stream is on the order of 0.005 microcurie per gram. The reported designation of this waste stream was disregarded in favor of classifying it as a Class A waste, eligible for management as a nonradioactive waste following decay of its ^{32}P and ^{35}S.

grouped separately and listed in Appendices A-14 (generated waste) and B-13 (stored waste). They are generated by nuclear utilities, academic institutions, government, and industry.

3.3.15 Miscellaneous Waste

Many waste streams were not adequately described in the National Profile to identify a treatment, as shown in Appendices A-15 (generated waste) and B-14 (stored waste). Some of these wastes were described as Class B sealed sources; soils with unknown contamination; uranyl nitrate; dried paint; paper, plastic, and glass; and other undescribed trash. These poorly described wastes were combined into the miscellaneous group.

3.3.16 Paint Waste

Several stored wastes were designated as paint waste. This waste did not appear to be as prevalent in the generated waste, so the waste streams are identified as a separate grouping only for stored waste, Appendix B-16. All of this waste was generated by nuclear utilities. It is assumed that the generation of this waste has been significantly reduced in recent years, since it is prevalent only with stored wastes.

3.3.17 Dioxin Waste

Another waste that appears only in stored waste is radioactively contaminated dioxins. This waste was generated by academic institutions and one governmental facility, most of it in the form of trash. Appendix B-15 provides the details on these wastes.

4. MANAGEMENT OPTIONS

As stated in Section 1, one of the purposes of this study is to determine which commercially generated low-level radioactive mixed wastes cannot be treated by available means and therefore must be managed in jointly regulated mixed waste disposal facilities. One primary regulatory option that can be employed to avoid disposal in a mixed waste disposal facility is the delisting petition. Three other regulatory options are available to reduce the cost of treatment or the cost of disposal: (a) a no migration variance, (b) a treatability variance, and (c) a Determination of Equivalent Treatment Petition. The following is a discussion of these options and an explanation of how each may be used to eliminate mixed waste disposal or allow treatment and management of the waste. Requirements for obtaining the exemption or variances, the historical success in obtaining the variance, and state regulations and restrictions relating to the variances are also provided.

In addition to regulatory-based options, management options relating to avoidance of waste generation and storage for decay are discussed in detail. Section 4.3 outlines options relating to treatment of waste. Available and anticipated treatment options are discussed and the vendors offering different treatment technologies are specifically identified.

4.1 Regulatory-Based Management Options

4.1.1 Delisting

4.1.1.1 Description. RCRA regulations in 40 CFR 261 list approximately 138 industrial waste streams as hazardous wastes (the F- and K-listed wastes). These wastes were listed because they exhibit one or more of the characteristics of hazardous wastes, or they contain specific components known to be toxic or otherwise hazardous at levels of regulatory concern. A waste stream from any facility that qualifies as one of the waste streams listed may be regulated as a hazardous waste. The EPA is not required to indicate on a facility-by-facility basis that the hazardous components are actually present.

In addition to these F- and K-listed waste streams, EPA designated 202 discarded commercial chemical products as acute hazardous wastes (the P-list wastes), and 445 other chemical products as hazardous wastes (the U-list wastes). To qualify as a listed waste under the P or U lists, the chemical product must be disposed of as a commercially pure grade of the chemical (any technical grade of the chemical and all formulations in which the chemical is the sole active ingredient). However, if the chemical enters into a mixture or a reaction that is part of a manufacturing process, the manufacturing process waste is NOT a listed waste unless the manufacturing process itself is listed (F- or K-listed wastes) or the waste exhibits hazardous characteristics as defined by 40 CFR 261, Subpart C (e.g., corrosivity, ignitability, reactivity, or toxicity characteristic).

EPA has recognized that a listed waste from a particular facility may not actually be hazardous. This situation may occur if:

- The waste does not contain the components or exhibit the characteristics for which it was originally listed
- The waste contains the components at relatively low levels

- The listed components are present in an immobile form.

These situations generally occur where the waste has been treated so it no longer contains the components for which the waste was originally listed, or where raw materials are different from those assumed when the regulations were drafted. Although treatment residues remain as listed hazardous waste under the "derived-from" rule, 40 CFR 261.3(c)(2)(i), EPA may modify this rule in the Hazardous Waste Identification Rule (HWIR) to be proposed in September 1995. The new HWIR may announce that treatment residuals that do not exhibit a hazardous characteristic are no longer listed waste. In the meantime, to accommodate the derived-from rule, 40 CFR 260.20 outlines a process called delisting to remove a specific generator's waste from the list of hazardous waste.

The regulations pertaining to delisting require demonstrations that the **treated** waste is no longer hazardous and, therefore, is not required to be managed in a land-based unit meeting RCRA standards. A delisting action is a **health-based** decision; in contrast, treatment standards established under 40 CFR 268 are **technology-based** standards. To qualify for delisting, some wastes may need to be treated beyond the level that is considered by EPA to be best demonstrated available technology. Where the delisting demonstration is successful, the wastes can be disposed of as nonhazardous waste for an unlimited period of time, outside the jurisdiction of all Subtitle C requirements of RCRA. In the case of mixed waste, such disposal could be in a low-level radioactive waste disposal facility regulated solely under the AEA. Disadvantages of the process include the site- and waste-specific nature of the exclusion, the extensive waste analyses required, the extensive groundwater monitoring requirements, and the comprehensive rulemaking procedures involved. The regulations do not allow submission of "generic" petitions.

There are 3 different types of delisting exclusions: standard, conditional, and upfront exclusions. A standard exclusion is granted when a petition shows that the waste meets the delisting criteria and variability of the waste composition is not of concern. When variability is a concern, a conditional exclusion may be granted. Delisting levels for key waste constituents and periodic testing to demonstrate that the waste remains nonhazardous are typical requirements under a conditional exclusion. An upfront exclusion may be granted to a facility prior to its construction. The petitioner must demonstrate that the waste will meet the delisting criteria based on preliminary treatability studies. Once the facility is operational, the petitioner must typically perform extensive verification testing to ensure delisting levels are obtained.

4.1.1.2 Requirements. Standards in 40 CFR 260.20 outline the procedures for delisting these waste streams. Figure 4-1 illustrates the delisting process. The EPA Manual, *Petitions to Delist Hazardous Wastes: A Guidance Manual* (U.S. Environmental Protection Agency, 1993) outlines specific requirements for the delisting petition based on those regulations. EPA suggests that this guide be followed closely to expedite the review process. In brief, delisting petition requirements include the following:

- A detailed description of the manufacturing process, treatment process, or other operations that produced the listed wastes. Examples may include:
  - Descriptions of production lines and major items of equipment, including details of the stages of the typical operating process
  - Descriptions of any surface and equipment preparation, cleaning, degreasing, coating or painting processes
  - Schematic diagram of all processes.

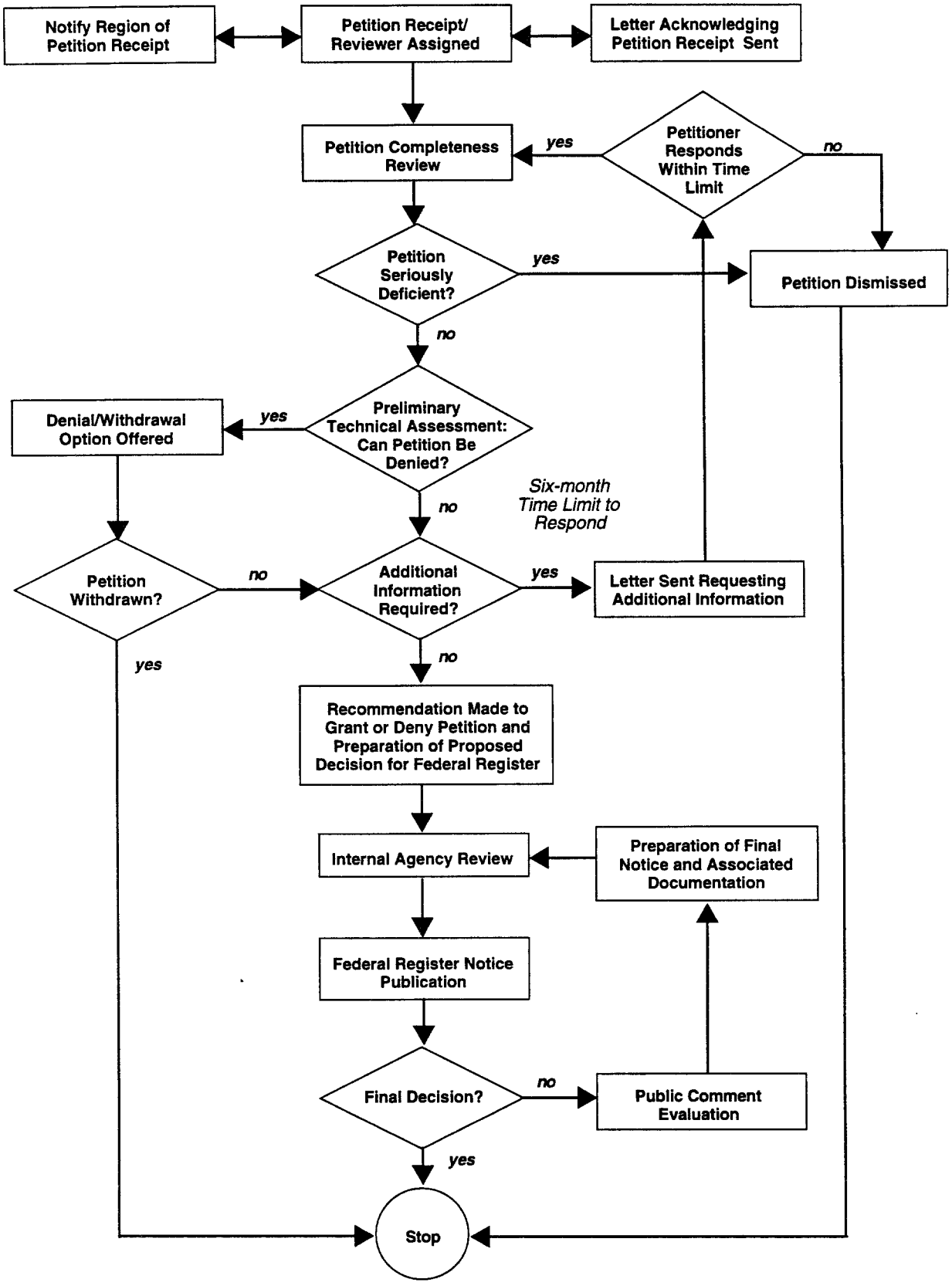

Figure 4-1. Petition review process.

- A description of the waste including a discussion of why the waste is listed as hazardous, an estimate of the average and maximum monthly and annual quantities of waste, and a description of how the waste is managed.

- A discussion of why samples collected in support of the demonstration represent the full range of variability of the petitioned waste. A minimum of four representative samples must be tested for the following:

  - Specific hazardous components for which the waste was listed
  - Four hazardous waste characteristics [or explanation as to why the characteristic(s) could not be present in the waste]
  - Appropriate leachate tests for the toxicity characteristic leaching procedure (TCLP) metals, nickel, and cyanide
  - Total concentrations of the TCLP metals and nickel
  - Hazardous components listed in 40 CFR 261, Appendix VIII, likely to be present in waste at significant levels
  - Total organic carbon (TOC)
  - Total oil and grease.

- Chain-of-custody records and quality control (QC) data for all analytical data. Analyses are expected to conform with QC procedures as described in EPA publication SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (Third Edition) (U.S. Environmental Protection Agency, 1992a).

- A list of all materials used in the manufacturing or other operating processes that produce the waste (examples include raw materials, intermediate products, by-products, products, oils and hydraulic fluids, and surface preparation materials).

- Groundwater monitoring data (required by EPA, not specifically outlined in manual).

The manual also outlines four major steps in the delisting approval process:

1. Development and submittal of the petition to EPA (or authorized state agency).

2. Review of the petition by EPA. If petitions are incomplete, EPA requests additional information. When the petition is deemed complete, EPA makes a tentative decision to grant or deny the request.

3. Publication of the proposed decision and request for public comments in the *Federal Register.* If no new significant information is received, the EPA publishes a final decision. If new information is received, the EPA reevaluates its tentative decision.

4. Final rule published in the *Federal Register.*

4.1.1.3 Historical Success Rate. Discussions with EPA officials responsible for the review of delisting petitions indicate that petition approvals are difficult to obtain. As of March 1993, 792 petitions had been received by EPA Headquarters, with a 15 to 20% approval rate among petitions found applicable. However, EPA indicates that any treatment residual that

meets current allowable concentrations under the 40 CFR 268 land disposal restriction levels usually will be a good delisting candidate. Determinations on petitions received by EPA are as follows:

Delisting Petition Determinations

Total Petitions Received	792
Granted	103
Denied	111
Withdrawn	308
Dismissed (insufficient information)	28
Inapplicable (wastes determined not to be hazardous; therefore, not subject to RCRA standards or petitioning process)	197
Referred to State Authorities	31
Active	14
	(as of March 3, 1993)

Many of the petitions had been received from F006 electroplating facilities and K061 electrical arc furnace dusts. Only a couple of petitions had been received for mixed wastes. Discussions with EPA staff indicate that most petitions are denied because they did not include sufficient information to determine that the wastes in question were no longer hazardous.

As of December 1994, 13 states and the District of Columbia have authority to approve delisting petitions. These states are Colorado, Georgia, Idaho, Indiana, Illinois, Michigan (except delisting petitions submitted in conjunction with facility closure), Minnesota, Nebraska, North Carolina, New Jersey, North Dakota, South Dakota, and Utah. Approval rates and times were similar to those for EPA. In unauthorized states, EPA also encourages petitioners to contact state authorities to determine what procedures might be necessary for delisting under state laws.

The authorized state delisting requirements must meet or surpass EPA requirements. Most of the states authorized by EPA to review delisting petitions are more stringent than EPA. The state program's authority is limited to the state granting the petition and is not transferable to another state. Therefore, a company cannot assume that the material or process delisted in Nebraska will be delisted in North Carolina or California. State authorization is appropriate for generators operating in only one state. Thus, most petitions go through EPA Headquarters in Washington, D.C., because of the unrestricted approval. Thirty-one petitions received as of March 3, 1993, were referred to state authority.

4.1.1.4 Costs. No figures have been published regarding costs; however, the EPA staff estimates that a delisting petition could cost $200,000. The cost will vary depending upon the volume of waste and the complexity of the sampling and analysis processes. Most of the cost is in

the sampling and analysis of the waste.[6] One DOE facility has spent over $500,000 in staff time and $500,000 in laboratory expenses and has yet to receive the sought after delisting.[7]

4.1.1.5 EPA Review. EPA gives most delisting petitions a processing time frame of 2 years. This schedule varies with the completeness and accuracy of the submitted petition. However, the Delisting Section of the EPA has recently suffered severe budget cuts that could make delisting petition review many times longer in the future.

To ensure that the review process runs smoothly and expeditiously, EPA offers a few suggestions. First, to evaluate the potential cost and effectiveness, the RCRA Hotline (1-800-424-9346) can send a copy of a similar facility's approved petition and background documentation. When drafting a delisting petition, the EPA manual, *Petitions to Delist Hazardous Wastes: A Guidance Manual* (U.S. Environmental Protection Agency, 1993) should be followed closely. Submittal of a "Draft Sampling Plan" prior to any waste sampling also speeds the process. The sampling plan gives information on the type of waste, the intention of sampling the waste, and the plan or procedure to sample the waste. EPA will approve and/or give suggestions to successfully complete the plan or final petition submission.

4.1.2 No Migration Variance

4.1.2.1 Description. A no migration variance is a formal decision rendered by EPA to allow land disposal of specific wastes that do not meet the treatment standards required under the land disposal restrictions. The variance is valid for 10 years after which the petition must be re-approved.

Permanent no migration disposal units must be constructed at sites where hydrogeologic and geologic factors guarantee that material will not migrate out of the unit. Manmade barriers or engineered systems are also required as reinforcement to the natural barriers. Temporary no migration units may be constructed at sites that do not exhibit the rare hydrogeologic and geologic factors, as long as the wastes are removed well before the failure of the engineered barrier system. The final land disposal restriction rule (51 FR 40572) and EPA's *No Migration Variances to the Hazardous Waste Land Disposal Prohibitions: A Guidance Manual for Petitioners* (U.S. Environmental Protection Agency, 1992b) suggest that a temporary no migration unit may serve as temporary storage for accumulating sufficient quantities of waste for treatment or disposal.

A generator of mixed waste may find this option useful as temporary long-term storage until technology provides adequate treatment or the required period under the storage for decay option is completed (see Section 4.2.3). It should not be considered for permanent disposal because the variance is subject to renewal every 10 years.

The no migration petition requirements are substantial and costly with little likelihood of success. To date, EPA has received 31 petitions, with no petitions granted. Given the costly and seemingly futile nature of the no migration variance, its usefulness as a regulatory management option is questionable.

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6. Personal communication with Jim Kent, Chief, Delisting Section, U.S. Environmental Protection Agency, Washington, D.C., December 6, 1994.

7. Personal communication with Maurice Higeura, Raytheon Environmental, Richland, Washington, December 23, 1994.

4.1.2.2 Requirements. Specific statutory language requires persons applying for a no migration petition to demonstrate "to a reasonable degree of certainty, that there will be no migration of hazardous constituents from the disposal unit or injection zone for as long as the wastes remain hazardous" [40 CFR 268.6 (a)]. The EPA interpreted this language as allowing no migration variances only if hazardous components will not exceed EPA-approved human health-based levels (or environmentally protective levels where appropriate) beyond the boundary of the disposal unit. In most cases, the disposal unit boundary is defined as the outermost limit of engineered components, but it may be defined differently in some site-specific cases.

The No Migration Guidance outlines critical components that should be included in the application. These components include:

- Waste Description
- Facility Description
- Site Characterization
- Monitoring Plans
- Waste Mobility Modeling
- Assessment of Environmental Impacts
- Prediction of Infrequent Events
- Quality Assurance and Quality Control (QA/QC).

Petitions are submitted to and reviewed by EPA Headquarters with assistance from EPA regional and state personnel (no states have approved petition review programs). The reviewers perform an initial completeness review. Once the initial review is completed, EPA will decide if additional information is needed to make a decision on the petition, and will request such information through a letter to the petitioner.

Once the reviewers have received all necessary information, a formal technical review will be performed. Upon completion, a formal decision to grant or deny the application will be made. If the tentative decision is to grant the petition, the EPA will publish a notice in the *Federal Register* describing its intent. If the tentative decision is to deny the petition, a letter will be sent to the petitioner of the intent to deny and offer the opportunity to withdraw the petition. If the application is not withdrawn, the EPA will publish a *Federal Register* notice describing its intent.

4.1.2.3 Historical Success Rate. Discussions with EPA Headquarters officials responsible for review of no migration petitions for disposal indicate that the approval process is time consuming and resource intensive with little likelihood of petition approval. As an example, one petition from a petroleum refinery consisted of 17 4-inch binders. EPA has not received a new petition in years.[8] The petitions are almost exclusively from the petroleum refining industry.

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8. Personal communication with Newman Smith, EPA Office of Solid Waste, Permits, and State Programs Division, Washington, D.C., December 15, 1994.

No petitions have been received for units accepting commercially generated mixed wastes; however, one petition pertained to a demonstration facility for disposal of transuranic mixed wastes (Waste Isolation Pilot Project).

4.1.3 Treatability Variance

4.1.3.1 Description. A treatability variance allows a generator or treatment facility to dispose of a waste under less stringent treatment levels than the levels specified in the land disposal restrictions. This option is appropriate only if a waste cannot be treated to the specified treatment standard or if the treatment technology on which the standard is based is inappropriate for the waste as specified in 40 CFR 268.44(a). For example, wastes with a complex matrix, such as mixed waste, may be difficult to treat either to the acceptable level or by the required treatment method, because the waste is significantly different from the wastes considered when EPA established the standards. With regard to mixed waste, a treatability variance may be appropriate for small volumes of Class B and C wastes, or other wastes where radioactivity concerns tend to dominate waste management alternatives. Another example is a variance for treatment of internally contaminated lead acid batteries that currently has a standard of thermal recovery in secondary lead smelters.

With the promulgation of Phase II of the Land Disposal Restrictions, generators must also treat to the most stringent level under the universal treatment standards for underlying hazardous constituents reasonably expected in the waste (59 FR 47982, September 19, 1994) (See Section 4.2.1). This rule has the effect of making mixed waste difficult to treat in more instances than previously required. Therefore, the treatability variance has the potential to become an even more important regulatory option for the management of mixed waste.

To be granted a treatability variance, a petitioner must show that "because the physical or chemical properties of the waste differs significantly from wastes analyzed in developing the treatment standard, the waste cannot be treated to specified levels or by the specified methods" [40 CFR 268.44(a)]. If the variance is granted, the generator or treatment facility is free to use the EPA-approved alternative treatment standard. Variances are not approved based on evidence that adequate BDAT treatment capacity is unavailable.

4.1.3.2 Requirements. Under 40 CFR 260.20 treatability variance petitions must include:

- The petitioner's name, address, and statement of interest in obtaining a treatability variance
- A description of the proposed action
- A statement of the need and justification for the proposed action, including any supporting tests, studies, or other information.

In addition, EPA requests that the following information also be included in treatability variance petitions (51 FR 40606):

- The name, address, and EPA ID number of the facility generating the waste, and the name and telephone number of the plant contact.

- A description of the process(es) and feed materials generating the waste and an assessment of whether such process(es) or feed materials may produce a waste that is not covered by the demonstration.

- A description of the waste sufficient for comparison with the wastes considered by the agency in developing BDAT, and an estimate of the average and maximum monthly and annual quantities of waste covered by the demonstration. This information can be obtained from the appropriate EPA BDAT background document. These documents are listed on page 40636 of the November 7, 1986, *Federal Register*, page 31210 of the August 17, 1988, *Federal Register*, and page 26646 of the June 23, 1989, *Federal Register*. No similar list of documents was published for wastes covered by the third-third rule (Elsevier Science Inc., 1994).

- If the waste has been treated, a description of the system used for treating the waste, including the process design, operating conditions, and an explanation of the reasons the treatment standards are not achievable or are based on inappropriate technology for treating the waste. (Note: The petitioner should refer to the appropriate BDAT background document as guidance for determining the design and operating parameters that the agency used in developing treatment standards.)

- A description of the alternative treatment systems examined by the petitioner (if any), a description of the treatment system deemed appropriate by the petitioner for the waste in question, and, as appropriate, the concentrations in the treatment residual or extract of the treatment residual (using the TCLP) that can be achieved by applying such treatment to the waste.

- The dates of the sampling and testing.

- A description of the methodologies and equipment used to obtain representative samples.

- A description of the sample handling and preparation techniques, including techniques used for extraction, containerization, and preservation of the samples.

- A description of the tests performed (including results).

To support a petition for a treatability variance, EPA suggests that the petitioner (59 FR 48023):

- Collect and analyze at least four samples of the untreated and treated waste to fully characterize the effect of the available treatment technology. The exact number of samples is determined during EPA's review of the petition.

- Ensure that simple pretreatment methods are not overlooked by making an investigation and report on available pretreatment steps that could significantly improve the effectiveness of the treatment being conducted (e.g., settling to reduce total suspended solids). An extensive or expansive engineering analysis is not required here.

- Make a good faith effort, based on the available treatment process knowledge, to explain why the treatment standard is not achievable for the waste. Again, an expansive engineering analysis is not required.

Treatability variance petitions are reviewed by EPA Headquarters. One copy of the petition should be sent to the Administrator, U.S. Environmental Protection Agency, 401 M Street, S.W., Washington D.C. 20460. An additional copy marked "Treatability Variance" should be submitted to Chief, Waste Treatment Branch, Office of Solid Waste (WH-565), U.S. Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. 20460 as specified in 51 FR 40606.

In determining whether a variance should be granted, the EPA will first look at the design and operation of the treatment system being used. If EPA determines that the technology to be used is consistent with regulatory guidelines, it will evaluate the waste to determine if the waste matrix or physical parameters are such that the revised technology properly reflects treatment of the waste.

In cases where more than one technology is applicable to a waste, the petitioner would have to demonstrate that the treatment standard cannot be met using any of the technologies, or that none of the technologies is appropriate for treatment of the waste.

After the EPA has made a determination on the petition, its proposed decision will be published in the *Federal Register*, followed by a 30-day comment period. After review of the public comments, EPA publishes its final determination in the *Federal Register* as an amendment to the treatment standards in 40 CFR 268. Site-specific variances are exempt from these rulemaking procedures.

4.1.3.3 Historical Success Rate. As of December 1994, 25 treatability variance petitions have been received by EPA Headquarters. Of that number, 3 facilities received variances, 16 were withdrawn, and 6 to 10 are pending. The petitions concerned the following types of waste: wastewater treatment sludges from electroplating operations (EPA F006); chromium contained in asbestos (EPA D007); API separator sludge (EPA K051); and soil and debris from cleanup operations. No petitions have been submitted involving mixed waste.

Successful treatability variances were granted to Craftsman Plating and Tinning Corporation and Northwestern Plating Works, Inc., two electroplating wastewater facilities located in Chicago, Illinois (56 FR 12351). Although both facilities were found to be properly operating well-designed BDAT treatments, they could not meet total cyanide standards (590 mg/kg) for their sludges. Both of the facilities are achieving an EPA established 0.86 mLr/L **amenable** cyanide standard in the effluent (standard for F006 wastewater) exiting the alkaline chlorination systems. In achieving these levels, the operating results will be used as the basis for alternative treatment standards for total cyanides in the sludges that are generated after alkaline chlorination treatment. EPA has determined that the appropriate alternative total cyanide standard for the Craftsman facility is 1,800 mg/kg and the Northwestern facility is 970 mg/kg.

4.1.3.4 Costs. Review time for the petitions has varied between 4 months and 1 year. Average cost estimates are $40,000 for gathering of appropriate information and development of the petition.[9] Total cost of the submittal depends on the cost of the demonstration.[10]

EPA review of treatability variances has been severely limited because of budget constraints. No agency action has been taken on pending applications in over 3 years.

4.1.3.5 Combination Treatability Variance/Delisting Petition. On one occasion, EPA issued a treatability variance and delisted the treatment residue under a single application process. Ordinarily, the derived-from rule causes the residue from a treated listed waste to remain a listed waste [40 CFR 261.3(2)(i)]. However, when a treatment process works so well that the treatment residue is rendered nonhazardous, EPA may also delist the residue. This streamlined process was used for the electric arc-furnace dust waste stream. A high-efficiency incineration process was demonstrated to work well enough to justify the removal of the residue from the hazardous waste list.

Although there are no regulatory procedures for the combined process, both the treatability variance and delisting procedures must be followed. It should be noted, however, that the combined procedure is available only when it can be demonstrated that a technology renders a residue nonhazardous. This procedure is an exception rather than the rule.[11] A combined treatability variance/delisting petition should be sent to Richard Kinch at the Office of Solid Waste, Waste Management Division, 401 M Street S.W., Washington, D.C. 20460.

4.1.3.6 Determination of Equivalent Treatment Petition. Another related regulatory option is a "Determination of Equivalent Treatment" petition under 40 CFR 268.42(b). According to the rule, "[a]ny person may submit an application to the Administrator demonstrating that an alternative treatment method can achieve a measure of performance equivalent to that achieved by methods specified [in the LDR rules]. The applicant must submit information demonstrating that his treatment method is in compliance with federal, state, and local requirements and is protective of human health and the environment."

Determination of Equivalent Treatment petitions are usually submitted when a material carries a wide range of waste codes, which is often the case for mixed waste. The petitions are also useful when the regulated material is no longer in its original form, such as a material carrying a code for a liquid, but the material is now a solid and the liquid treatment is no longer appropriate.

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9. Personal communication with Elaine Eby, Chief, Treatability Variance Section, U.S. Environmental Protection Agency, Washington, D.C., May 9, 1991.

10. Personal communication with Shaun McGarvey, Treatability Variance Section, U.S. Environmental Protection Agency, Washington, D.C., December 6, 1994.

11. Personal communication with Richard LaShier, U.S. Environmental Protection Agency Office of Solid Waste, Characterization and Assessment Division, Washington, D.C., December 15, 1994.

According to EPA personnel, Determination of Equivalent Treatment petitions are more common than treatability variance petitions.[12] They also carry the advantage of being more likely to be granted than denied. This is largely because the treatment is a collaboration or negotiated process between the petitioner and EPA.

4.1.4 Host State Regulations and Restrictions

An analysis was performed comparing current standards in declared host states for preparation and submittal of the delisting petition, no migration variance, and treatability variance to the Federal standards for preparation and submittal. With regard to the delisting petitions, four of the thirteen host states are authorized to review and approve delisting petitions (Illinois, Nebraska, New Jersey, and North Carolina). In all of those states, requirements for preparation of the petition are identical to those of the Federal standards. The remaining nine host states have standards for delisting petitions that are equivalent to the Federal program, but EPA has not authorized the states to review and approve the petitions. Review and approval authority in those states remains with EPA Headquarters. (When EPA retains delisting authority, states must concur with the EPA decision before the decision becomes final.)

All host states except California, Connecticut, Nebraska, and Texas have or are adopting standards for no migration petitions equivalent to the Federal standards; however, no states are currently authorized to review and approve the petitions. EPA Headquarters reviews and approves all no migration petitions, with states' concurrence. States that specifically omitted no migration petitions from their RCRA program intentionally excluded the no migration petition as a regulatory option. Such an omission of a Federal variance is allowable, as states may adopt stricter standards than the Federal program.

All host states except Texas have adopted or are adopting equivalent standards for treatability variances; however, no states are authorized to review and approve the variances. EPA Headquarters reviews and approves all treatability variances (with state concurrence). Table 4-1 summarizes these applicable state regulations in each potential host state.

4.2 Management Options that Avoid Mixed Waste Generation

An often overlooked management option is to avoid generating mixed waste altogether. Two methods can avoid mixed waste generation: material substitution and process modification. Storage for decay can also be considered mixed waste avoidance, although technically mixed waste is generated. However, the waste ceases to be mixed waste following the decay period because its radioactivity cannot be measured by normal means.

4.2.1 Material Substitution

Material substitution is one of the most desirable options for preventing the formation of mixed waste. The concept of material substitution involves replacing a chemically hazardous reagent with one that is not hazardous. For example, water-based solvents can be used instead of solvents such as toluene or chloroform. As substitutes for radioactive tracers, techniques using enzymes and fluorescent labels can be used to reduce the radioactive wastes.

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12. Personal communication with Shaun McGarvey, Treatability Variance Section, U.S. Environmental Protection Agency, Washington, D.C., December 6, 1994.

Table 4-1. Summary of requirements for variances in declared host states.

State	Delisting Petition	No Migration Variance	Treatability Variance	EPA Authorization to Regulate Mixed Waste
California	California Administrative Code, Title 22, Division 4.5, Chapter 10, Section 66260.200	(Intentionally excluded)	Chapter 18, Section 66268.44	Yes
Connecticut	Regulations of Connecticut State Agencies, Title 22a, Chapter 449(c), Section 100	Section 22a-449(c)-108 (Expressly excluded)	Section 22a-449(c)-108	Yes
Illinois	Illinois Administrative Code, Title 35, Subtitle G, Chapter I, Section 720.122[a]	Section 728.106	Section 728.144	Yes
Massachusetts	Code of Massachusetts Regulation, Agency 310, Chapter 30, Section 142	Section 30.755	Section 30.775	No
Nebraska	Nebraska Department of Environment Control, Title 128, Chapter 6, Section 003.01[a]	(Not included)	Chapter 20, Section 003	Yes
New Jersey	New Jersey Administrative Code, Title 7, Chapter 26, Section 8.17[a]	--[b]	--[b]	No
New York	New York Compilation of Rules and Regulations, Title 6, Chapter 370.3(c)	Section 376.1(f)	Section 376.4(e)	Yes
North Carolina	North Carolina Administrative Code, Title 15A, Subchapter 13A, Section .0003(b)[a]	Section .0012(a), Part 268	Section .0012(c), Part 268	Yes
Ohio	Ohio Administrative Code, Title 3745, Chapter 50, Section 221	Section 3745-59-06	Section 3745-59-44	Yes
Pennsylvania	Pennsylvania Code, Title 25, Article VII, Section 260.22	--[b]	--[b]	No
South Carolina	South Carolina Code of Regulations, Chapter 61-79, Section 260.22	Section 268.6	Section 268.44	Yes
Texas	Texas Administrative Code, Title 31, Part IX, Chapter 335, Section 335.346	Section 335.431(c) (Intentionally excluded)	Section 335.431(c) (Intentionally excluded)	Yes
Washington	Washington Administrative Code, Title 173, Section 173-303-072	Section 173-303-140(6)	Section 173-303-140(6)	Yes

a. Delisting review authority delegated to these states. In other states, EPA retains the authority to delist a hazardous waste.
b. States' regulations being proposed; Federal standards apply until final issuance.

The constraint on material substitution is that the possible substitute must perform comparably to the material it is replacing. For instance, if chloroform is used in an extraction procedure, not only must the substitute be capable of extracting equally well, but it also must not interfere with the process, such as by introducing water or an undesirable chemical into the extraction process.

Material substitution must be evaluated on a case-by-case basis. The user needs to evaluate the economic and technical desirability of substitution. Also, users may not be interested in reducing mixed waste at the expense of tampering with established protocols. An example of such reluctance is substitution of a nonhazardous scintillation cocktail for the typically toluene- or xylene-based cocktails. In spite of the fact that nonhazardous cocktails cost approximately 10% less than their hazardous counterparts, the industry continues to use the hazardous cocktails. Continued use is a result, in part, of the belief that nonhazardous cocktails do not perform as well as their hazardous counterparts.

Another possible option is substituting a radionuclide with a shorter half-life for one that has a longer half-life. For example, if ^{32}P (with a half-life of 14.3 days) could be substituted for ^{3}H or ^{14}C (with half-lives of 12.3 and 5,730 years, respectively), the radioactive portion of the waste could be stored until it is no longer considered to be radioactive. This option is discussed in greater detail in Section 4.2.3, Storage for Decay.

4.2.2 Process Modifications

Process modifications can reduce the volume or degree of hazard (either chemical or radiological) of the waste stream. The questions to ask when determining if a process modification is required are:

1. What step in the process actually produces the mixed waste?

2. What is the purpose of the step that produces the mixed waste?

3. Are there modifications that can be made to the process or alternative process that will acceptably perform the objective of the original process step, while at the same time reduce the volume or hazard of the waste stream?

For example, mixed wastes generated from decommissioning a facility can be minimized if, during the design phase, proper care is taken to ensure that materials and equipment that are likely to become radioactively contaminated do not contain any components that will be considered hazardous when it is time to dispose of them.

Other examples of reformulating or redesigning a process include:

- Reformulating a process by changing from a uranium/antimony catalyst to an iron/bismuth catalyst for the production of acrylonitrile

- Redesigning a process by changing from solvent stripping of paint and coatings from contaminated surfaces to sand blasting the paints and coatings using pelletized dry ice (from carbon dioxide)

- Redesigning a parts cleaning process by incorporating ultrasonic cleaning instead of cleaning the parts with methylchloroform or by using pelletized dry ice for decontamination

- Replacing molten salt or lead baths with induction heating for heat-treating uranium billets

- Using small-bore tubing on high-pressure liquid chromatography (HPLC) to reduce the amounts of solvents required to perform analytical procedures.

Changing procedures and providing more detailed guidance concerning material handling and waste segregation can result in significantly reduced wastes for a minimal cost. For instance, a mixed waste is often generated as a result of the way a chemical or material is used, handled, or stored. Operational practices and procedures should be examined to determine if changes can be made. The questions to ask when determining whether procedural changes are appropriate include:

1. Does any of the mixed waste result from the way a material is used, handled, or stored?

2. What is the objective of the usage, handling, or storage practice that generates the mixed waste?

3. How can the usage, handling, or storage be changed to acceptably meet the objective identified in the second question while at the same time reduce or eliminate the hazard or volume of the waste stream?

For example, nuclear utilities have enforced a strict policy of limiting personnel and materials in radiologically controlled areas by restricting those areas to only essential activities and maintaining strict maintenance procedures. These procedural changes have reduced the quantity of waste that becomes contaminated low-level radioactive waste. Further, the storage and use of materials that can potentially result in a RCRA hazardous waste should be reduced or eliminated from these areas to the greatest extent possible.

Another change in practice would be in the area of inventory control. Facilities should consider purchasing based on the amount of material needed rather than purchasing based on price per volume. If a laboratory determines that it only uses one pint of a solvent-based reagent before the shelf life expires and it is currently obtaining one-gallon containers that end up radiologically contaminated, the laboratory should request one-pint containers of this material in the future. If the current vendor cannot provide the needed volume, the laboratory should change vendors or order a large container of the material to share among similar laboratories, if possible, before placing the product in a radiologically controlled area.

4.2.3 Storage for Decay

The radioactive components of some mixed waste can decay to levels that are not detectable. Upon specific approval from the NRC or an Agreement State, such wastes may be disposed of as a hazardous waste without regard to its radiological content if acceptable to the hazardous waste management facility. This process typically requires 10 to 12 half-lives of the longest-lived radionuclide present. NRC considers storage for decay appropriate for materials

with half-lives of less than 65 days. Of the most frequently encountered radionuclides in LLW, only ^{32}P, ^{35}S, ^{86}Rb, ^{203}Hg, ^{111}In, ^{76}As, ^{58}Co, ^{131}I, ^{125}I, ^{123}I, ^{99}Tc, ^{192}Ir, and ^{59}Fe have half-lives of 120 days or less. With estimated costs for disposal as high as $15,000 per cubic foot, storage for decay of materials with even longer half-lives may be economically and technically achievable. However, storage of hazardous waste is prohibited under RCRA Section 3004(j) unless it is for the purpose of "accumulating sufficient quantities to allow for the proper treatment, management, and disposal of the land disposal restricted wastes." NRC also discourages the use of storage as a long-term waste management option. For example, only 2.5% of the mixed waste generated by the Southwestern compact region was being managed using storage for decay in 1989, and the National Profile describes only limited use of this management option. Nonetheless, substitution of a short-lived radionuclide instead of a longer-lived counterpart can substantially reduce the volume and radiotoxicity of mixed waste requiring jointly regulated management.

4.3 Management Options Involving Treatment

If mixed waste generation cannot be avoided, treatment is required. Depending on the treatment chosen, the hazardous component may be separated from the radioactive components, may be destroyed, or the radioactive component may be decayed to nondetectable levels as discussed above. The result of such treatment is to produce a waste that can be more easily disposed of. In this section, the currently available treatment options for mixed waste are discussed as well as treatment options that are anticipated to become available within the next 5 years. Each of the vendors who offer treatment options for mixed waste are discussed. The treatment processes that each of these vendors provides are described and the types of waste that each vendor is currently accepting are also discussed. Section 4.3.2 describes the treatment options under development by DOE.

4.3.1 Commercially Available Treatment Options

There are several commercial vendors who are currently licensed and permitted to provide mixed waste treatment and disposal services and one vendor that anticipates obtaining permits for the processing of mixed waste within the next year. Each of these vendors is described below along with information on the types of wastes they are currently accepting for treatment.

4.3.1.1 Diversified Scientific Services, Inc. (DSSI). DSSI operates a 22,000 square-foot Solvent Processing Facility located in Kingston, Tennessee. This facility consists of a beneficial reuse complex that processes various liquid waste solvents by combusting them in an industrial boiler to generate electricity. DSSI currently has five overlapping permits that allow them to accept waste solvents with EPA waste codes of D001, D006 to D043, F001 to F005, and numerous U- and P-listed materials. DSSI accepts radioactive wastes with atomic numbers of 1 through 83 as well as small amounts of some transuranics. The limit on nuclides established in DSSI's current Radioactive Material License are established based on a total combined nuclide activity that cannot exceed 10 curies at any one time. A limit of 1 curie is established for nuclides with atomic numbers between 1 and 83 that are not specifically described in the license. In addition, maximum activity limits or mass limits are established for some individual nuclides, including uranium and plutonium. Appendix C-1 lists the EPA waste codes and nuclides accepted at DSSI. Also listed in Appendix C-1 are the acceptable limits for waste parameters for metals, polychlorinated biphenyls (PCBs), halogens, sulfur and phosphorus content, and physical properties. Wastes are accepted at DSSI in small containers of 5 gallons as well as in 30, 55, or 85 gallon drums, portable tanks, and bulk tankers.

In addition to the limits on radionuclide waste activity described above, DSSI's license also contains a limit of no more than a total of 22.5 curies of activity from ^{3}H and ^{14}C used as fuel in a single year and no more than 0.05 millicuries of ^{3}H and ^{14}C activity per gram of fuel combusted. The cost to the generator to dispose of low-level mixed waste fuel at DSSI could be as low as $30 per gallon with actual costs varying, based on the waste composition and the case specifics.

The point of contact for DSSI is Larry L. Hembree, Customer Service Supervisor, P.O. Box 863, Kingston, Tennessee, 37763, (615) 376-8714.

4.3.1.2 Envirocare of Utah, Inc. (Envirocare). Envirocare operates treatment and landfill disposal facilities at a site 75 miles west of Salt Lake City, Utah. The facility was originally given a permit in 1988 to dispose of NORM. In 1990, the facility received a RCRA Part B Permit, and in 1993 it received a Mixed Waste Treatment Permit and an NRC 11e.(2) [i.e., mill tailings] Disposal License.

In addition to providing disposal services for low-activity radioactive and mixed waste, Envirocare also operates a Mixed Waste Treatment Facility. The technologies available at this facility are chemical stabilization, chemical oxidation, chemical reduction, chemical deactivation, and neutralization. The corresponding treatment codes from 40 CFR 268.42 Table 1 apply to these activities: STABL, CHOXD, CHRED, DEACT, and NEUTR. The basic components of the treatment facility are solid separation and size reduction equipment, a blender unit, a mixing unit, reagent, and process water storage tanks. Envirocare has applied for, and expects to receive, a Part B permit for macroencapsulation (treatment designation MACRO) of contaminated lead shielding. In this process, a surface coating material such as a polymeric organic material is applied to substantially reduce surface exposure to potential leaching media.

Envirocare can accept mixed wastes with EPA waste codes D001 to D043, F001 to F012, F019, F024, F028, K011, K013, K050 to K052, K061, K069, and many P- and U-listed wastes. Appendix C-2 contains copies of information from the Envirocare Part B permit that lists acceptable waste codes. Envirocare can accept approximately 81 nuclides under its current Radioactive Material License. Limits on each of these nuclides are established based on maximum average activity concentrations in the waste for disposal.

The maximum capacity of the mixed waste treatment system is 150 tons of waste per day. Only one waste stream can be processed through the mixed waste treatment system at one time. These limits restrict the ability and incentive of Envirocare to process small quantity waste streams. Waste can be received at the Mixed Waste Treatment Facility in a variety of containers such as dump trucks, roll-off containers, and 55-gallon drums. Envirocare does not provide information on generator costs for waste disposal, but prefers to deal with cost issues on a case-specific basis.

The point of contact is Envirocare of Utah, Inc., Susan P. Rice, Program Manager, 46 West Broadway, Suite 240, Salt Lake City, Utah, 84101, (801) 532-1330.

4.3.1.3 Perma-Fix of Florida, Inc. (PFF). PFF operates two waste management processes at a 7.6 acre site in an industrial park in Gainesville, Florida. PFF holds a Part B permit for operation of a TSD facility and is authorized to handle certain mixed wastes by the Florida Department of Environmental Protection and the Florida Department of Health and Rehabilitation Services, under agreement with the NRC.

The first waste management process provides handling and disposal of liquid scintillation vials that are regulated as mixed waste. In this process, the vials are processed and prepared for use as a supplemental fuel in a rotary cement kiln operated by Oldover Corporation located at Green Cove Springs, Florida. The other waste management process provides handling, storage, and disposal of hazardous and nonhazardous wastes such as oil filters, air filters, and rags that are prepared for further processing and disposal at RCRA landfills.

PFF holds a Radioactive Materials License that allows liquid scintillation materials to be received and processed subject to a requirement that these materials be received, processed, and transported to Oldover in concentrations no greater than 0.05 microcuries per gram of medium. A total of 30 nuclides are permitted for liquid scintillation materials in the current license. The radioactive material license and Part B permit restrictions are located in Appendix C3.

PFF is in the process of applying for licensure to process additional liquid scintillation nuclides and additional chemicals other than liquid scintillation fluids that are contaminated with radionuclides. They are also seeking to obtain Part B permit modifications to allow additional waste codes and additional treatment capabilities including stabilization. If obtained, these additional capabilities would provide the ability to process scintillation fluids with a lower Btu content and a higher activity level and to process and ship wastes to DSSI after processing at PFF.

PFF could charge a waste generator approximately $180 to dispose of a 7.5-cubic-foot drum of liquid scintillation vials. The actual generator cost would depend on the waste stream specifics, the waste quantity, and the generator location.

The point of contact is Perma-Fix of Florida, Ben Warren, 1940 N.W. 67th Place, Gainesville, Florida, 32653, (904) 373-6066.

4.3.1.4 NSSI/Recovery Services Inc. (NSSI). NSSI operates a facility in a light industrial area in southeast Houston, Texas that receives and processes radioactive, hazardous, and mixed wastes. The facility has been in operation since 1971 and was issued a Part B permit in October 1990. NSSI is permitted to perform blending of wastes for offsite use as fuel; consolidate waste containers into lab packs; perform neutralization, oxidation, reduction, and other chemical reactions to render wastes less hazardous for offsite disposal; recycle solvents; perform centrifugation, filtration, and ion exchange in portable equipment; solidify or stabilize waste in containers; shred containers for recovery of the contents; consolidate miscellaneous compatible wastes; perform chemical and mechanical treatment in portable equipment to separate, settle, and clarify; remove hazardous constituents by absorption on solid media; dry solids to meet offsite disposal criteria; and recover waste chemicals for reuse or resale. The NSSI permit allows processing in a total of 20 tanks with a combined capacity of 58,530 gallons. A total of 179,093 gallons of container storage is provided in 4 container storage areas.

NSSI also holds a Radioactive Material License that allows a maximum activity of 2 curies for Group I nuclides as defined under Texas Regulations for Control of Radiation (TRCR) 44.5(a), 20 curies for Group II, 200 curies for Group III, and 2,000 curies for Group IV. In addition, a total activity of 2,000 curies is permitted for sealed radioactive sources received as radioactive waste. The radioactive material license and Part B permit restrictions are located in Appendix C4.

NSSI cannot provide final waste disposal costs without knowing the waste stream specifics, the state from which the waste is generated, and the final disposal site for the waste. However, the cost to the generator for performing the RCRA treatment and converting the treatment residue to a stabilized waste form that would pass the TCLP test for land disposal might be $100 to $150 per gallon of waste.

The point of contact is NSSI/Recovery Services Inc., Robert D. Gallagher, President, P.O. Box 34042, Houston, Texas, 77234, (713) 641-0391.

4.3.1.5 Scientific Ecology Group, Inc. (SEG). SEG is currently licensed for processing of radioactive waste and has applied for a Part B permit for processing low-level radioactive mixed wastes. Its present treatments include compaction and incineration. SEG is applying for permits to operate both incineration and steam reforming processes for the treatment of mixed wastes. The steam reforming process, as proposed by SEG, will chemically convert organic compounds to CO, H_2, CO_2, H_2O, and CH_4 by using steam reforming chemistry. These reforming reactions occur in a near oxygen-free environment in the presence of high temperature and superheated steam. Extremely high conversion of organics to conversion products are achieved with steam reforming. A significant advantage of this process is that it can be used to convert organic compounds contained within a solid matrix, thus allowing the processing of mixed waste forms that are not presently treatable using conventional incineration or combustion treatment. Steam reforming is not expected to be used routinely to treat waste having ^{14}C or ^{3}H concentrations greater than 2 millicuries per drum.

SEG has a current projected rate for treatment of a typical dry active waste of $300 per cubic foot. This projected cost is dependent on a number of factors that cannot currently be predicted.

The point of contact is Scientific Ecology Group, Inc., Tim Hallman, P. O. Box 2530, Oak Ridge, Tennessee, 37830, (615) 376-8169.

4.3.2 Treatment Options Under Development by DOE

The DOE Office of Technology Development has sponsored a Mixed Waste Integrated Program (MWIP) to assume responsibility for the research, development, demonstration, testing, and evaluation of new and emerging technologies for application to treatment and disposal of mixed low-level radioactive waste generated by DOE. The MWIP has identified technology areas that have the potential to be incorporated as treatment steps for mixed waste. Some of the technologies currently under investigation include biodegradation, freeze crystallization, biocatalytic destruction of nitrates, ion exchange and acid leaching for mercury removal, thermal treatment technologies for waste destruction such as plasma arc incineration and steam reforming, thermal vitrification, and thermoplastic encapsulation.

The mission of the MWIP is to identify, develop, and demonstrate technologies that treat DOE mixed low-level radioactive wastes into forms suitable for disposal. To be included in the MWIP, technologies must have improved performance, reduced risk, and minimized life-cycle costs over existing technology or provide treatment for waste streams for which no current treatment technology exists (Bloom and Berry, 1994). For example, biodegradation is being used to treat the hazardous component of uranium-contaminated liquid scintillation counting fluids at Mound Laboratories.

5. SPECIFIC WASTE STREAM STRATEGIES

Each of the waste streams identified as being generated in 1990 or in storage on December 31, 1990, was compared against the acceptance criteria of the available commercial treatment facilities, including those treatments that are likely to become available in the near future. The management strategy outlined in Figure 5-1 was applied to each waste stream.

Most of the **ignitable, corrosive, and biological** mixed wastes are likely to be treated out of existence, with few residues requiring disposal as jointly regulated mixed waste. Most ignitable wastes could be treated at DSSI subject to the activity limits described in Section 4.3; corrosives could be treated on site or by NSSI; and biological wastes could be treated by steam reforming. Some of the ignitable paint wastes would appear to require blending with other liquids before treatment at DSSI. Absorbed liquids and other solid ignitable wastes would be treatable when steam reforming technology becomes available subject to activity limits. Because these are characteristic wastes, their treatment residues are considered nonhazardous and would be disposable as solely low-level radioactive waste after treatment.

Very few **reactive wastes** are treatable by commercially available means because vendors such as DSSI, SEG, and PFF do not accept reactive waste. Envirocare accepts reactive D003 wastes for treatment but is limited in the types of treatments available and in the minimum quantity of waste that it can process as described in Section 4.3.1.2. As a result, Envirocare does not accept all of the D003 waste currently being generated. Relatively small volumes of reactive waste are generated, further reducing the likelihood that a commercial vendor will develop a treatment technology. The most likely treatment outlet for much of the reactive waste is via in-house, permitted, customized treatment by the generator. Such treatment would require a RCRA Part B Permit. Following DEACT, the required treatment under 40 CFR 268 and conformance to the universal treatment standards, the waste will no longer be a RCRA-regulated waste, allowing disposal as solely LLW. The National Profile data suggest that 13.15 cubic meters of generated reactive waste and 73.52 cubic meters of stored reactive waste would not have a currently available commercial treatment option.

Most **characteristic metal wastes** can be treated at NSSI by stabilization and precipitation and at Envirocare by macroencapsulation. Envirocare of Utah is expecting to receive a permit for macroencapsulation of lead shielding wastes. Among the wastes considered to be untreatable by available commercial vendors are retired brachytherapy sources in shielded casks, all of the nonaqueous mercury-contaminated wastes, and spent reactor control rods containing cadmium. Lead used as shielding is not considered by EPA to be a waste because the lead is being used as shielding and is not a waste. However, at least one state jurisdiction retains its right to be more stringent and regulates lead as a hazardous waste whether it is being used for shielding or not. Because of the high activity of the brachytherapy sources (84 curies), this waste was considered to not have an available treatment option. Of the 258.9 cubic meters of generated waste and 267.1 cubic meters of stored characteristic metal wastes, only 8.5 cubic meters of generated waste and 32.11 cubic meters of stored waste do not have an available treatment option.

Most of the **characteristic organic waste** will likely be treatable now or in the near future, when steam reforming becomes available. The 1.45 cubic meters identified as untreatable waste consisted of compacted trash with activities of ^{3}H, ^{14}C, and ^{125}I in excess of those allowable for steam reforming or supplemental fuel. Consequently, little of the 38.23 cubic meters of characteristic organic waste should require jointly regulated land disposal as mixed waste.

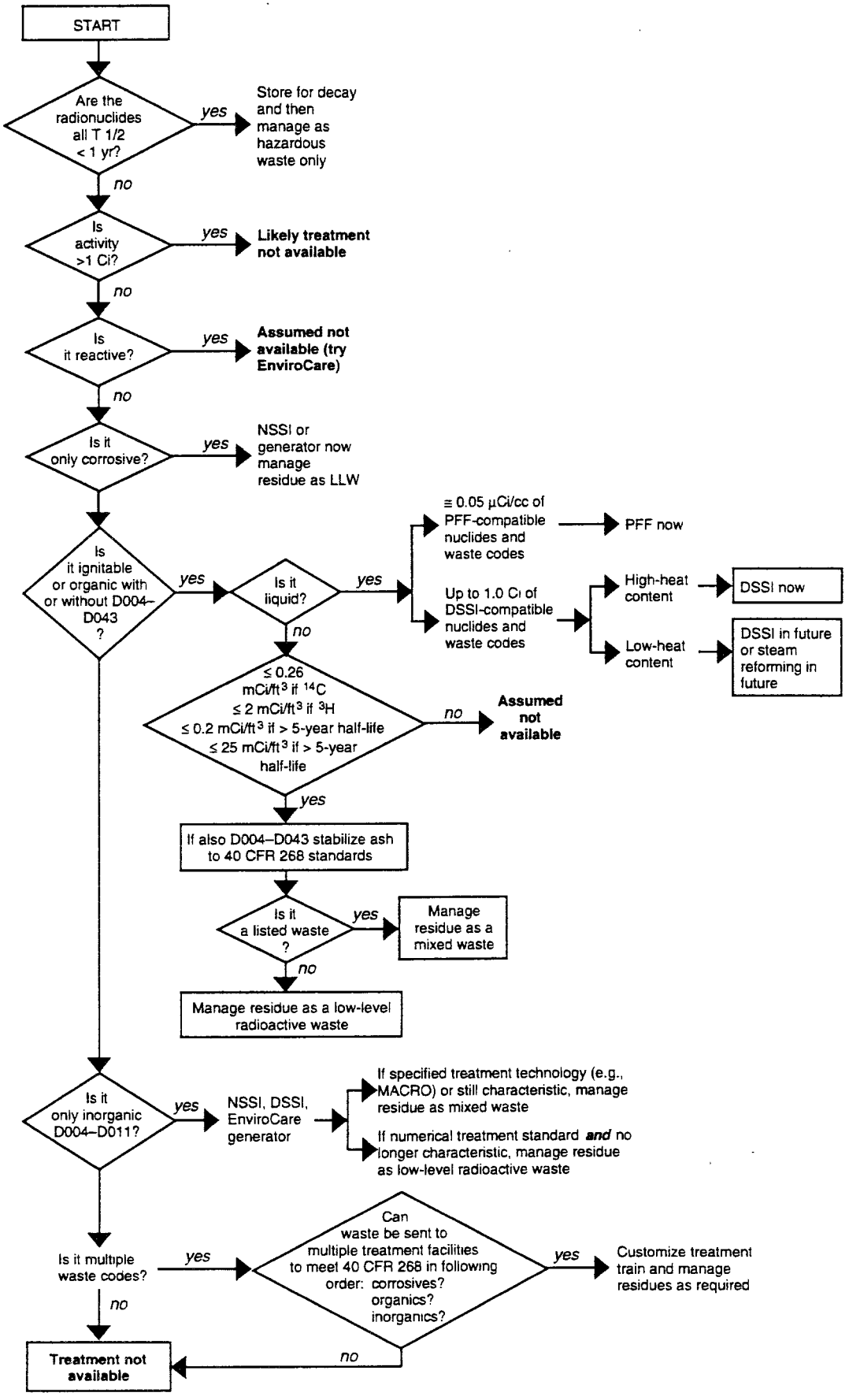

Figure 5-1. Treatment schematic.

Of the 99.7 cubic meters of **F001 and F002 wastes** that were generated in 1990, only 9.91 cubic meters cannot be treated. This untreatable waste consists of (a) a high activity (25 curies of ^{3}H and ^{14}C) Class A solidified resin waste generated by an industrial research and development facility and (b) still bottoms and filters from a decontamination unit using freon at an industrial research and development facility. It was assumed that even if steam reforming was available, the limits on radioactivity would likely exclude this waste stream. It was assumed that F001 and F002 liquid waste would be managed by DSSI without generation of listed waste residue, and low activity solid wastes would be managed using steam reforming. Steam reforming waste will result in a listed waste residue that would require jointly regulated disposal, if not delisted.

Similarly, for **F003 wastes** generated in 1990, only 0.43 cubic meters will likely not be treatable. This F003 untreatable waste has 1.98 curies of ^{60}Co, ^{58}Co, and ^{54}Mn in acetone and results from the in-core cleaning of instrumentation. The other 0.37 cubic meters consists of 100 millicuries of ^{14}C. An additional 0.72 cubic meters of stored acetone waste having 4.6 curies of similar radionuclides is also identified as untreatable. While steam reforming or DSSI should be able to treat the F003 component of the waste, the radioactivity exceeds DSSI's current license and is likely to exceed the limits for the steam reformer, when established. Because F003 wastes are listed solely for the characteristic of ignitability, treatment residues that do not exhibit the characteristic of ignitability do not need to be managed as F003 listed waste. Therefore, no other F003 treated waste meeting the treatment requirements of 40 CFR 268 should require management in a jointly regulated land disposal facility.

The only untreatable **F005 waste** generated in 1990 is described as 46 curies and 3.5 cubic meters of ^{3}H, ^{14}C, and ^{125}I waste in xylene and toluene liquid waste generated from research by an industrial research and development facility. No F005 wastes in storage were identified as untreatable. In spite of available treatment for the hazardous component of the waste, the radioactive component exceeds all existing and expected license limits for commercially available treatment, thus precluding treatment of this high activity mixed waste. Treatment residues from F005 steam reforming waste will require disposal as mixed waste unless delisted. Listed residues from generated wastes are estimated to be approximately 14.7 cubic meters, conservatively assuming no volume reduction for absorbed liquids, other solid waste, and trash.

Only one of the generated **P- and U-listed wastes** was identified as being untreatable by available commercial means: P030 and F005 in 2.095 cubic meters and 0.415 millicuries of ^{14}C in uncompacted trash, generated by a research and development industrial firm. This waste is also identified as an untreatable stored waste. The hazardous components are described as toluene and granite salts (a reactive waste). Most of the other liquid P- and U-listed waste was assumed to be treatable by DSSI, with or without blending with high Btu-content wastes. Steam reforming or other similar treatment will be needed for the absorbed liquids, ion exchange resins, solids, and trash waste forms. Wastes treatable through DSSI are assumed to have no RCRA-regulated listed residues; however, those from steam reforming will need to be managed as a listed waste. Conservatively assuming no volume reduction from the steam reforming process, approximately 8.4 cubic meters will require subsequent management as a listed waste residue under the existing derived-from rule.

Leaking sealed sources containing beryllium were identified as a P015 listed waste for both generated and stored wastes. Sealed sources containing beryllium are not considered to be a mixed waste because the beryllium is not a discarded commercial chemical product or a sole active

ingredient. A separate report on waste designation of similar sealed sources has been published by DOE (U.S. Department of Energy, 1994).

None of the generated or stored **oil wastes** were identified as being untreatable. Some may require blending with high Btu waste or treatment by steam reforming, but all are considered treatable without subsequent management of treatment residues as mixed waste.

Through blending, steam reforming, and existing treatments, all but 1.69 cubic meters and 208 millicuries of the **LSC wastes** are considered to be treatable using commercially available vendors, although 47.5 mCi of ^{32}P and ^{35}S may be stored for decay. As previously mentioned, one of these waste streams was categorized as being a Class C generated and stored waste; however, there is reason to believe that the designation is incorrect as LSC techniques do not work for high concentrations of radioactivity and the reported concentration is below the Class C limit. All but 1.39 cubic meters of the absorbed liquids were assumed to be treatable using steam reforming, and subsequent management of treatment residues of F005 absorbed liquid wastes will require management as a listed waste. These treatment residues are estimated to be approximately 42.55 cubic meters for those generated LSC wastes identified as solids or absorbed liquids. The activity limits on the waste input to the SEG steam reforming process as described in Section 4.3 limit the ability of this process to treat 0.07 percent of the volume and 1.3 percent of the activity of the generated LSC wastes.

Of the generated wastes having **multiple waste codes**, five wastes that were reactive and one high-activity waste were identified as untreatable. These untreatable wastes comprise 77.8 cubic meters with 94% of that waste originating from a single Federal government research and development facility in the form of laboratory trash from research. Of the stored wastes having multiple waste codes, six were identified as untreatable: four were reactive, one had high activity, and one was both reactive and a high-activity waste. Treatment from DSSI and steam reforming is assumed for the other wastes. Conservatively assuming no volume reduction of solids from steam reforming results in an estimated additional 0.52 cubic meter requiring management as a listed, derived-from waste.

It is impossible to make definitive treatment assumptions regarding the 38 cubic meters of **miscellaneous generated waste** and 76 cubic meters of miscellaneous stored waste due to incomplete characterization information on this group of waste. However, at least one of these stored waste streams has such high activity as to be untreatable by all existing and expected methods. This waste is identified as 275 curies of ^{14}C contaminated hazardous waste bulk liquid from an industrial manufacturer.

The following tables summarize the results of this analysis. Table 5-1 lists the waste streams generated in 1990 with no treatment option available. Table 5-2 provides volume summaries of these untreatable generated wastes categorized by hazardous constituent group and physical form. Table 5-3 details activity in millicuries of these untreatable generated wastes. Tables 5-4 through 5-6 list similar information for waste streams in storage as of December 31, 1990, with no treatment option available.

Untreatable wastes constitute a very small percentage of generated and stored mixed waste volumes. However, because of the limitations imposed by radioactive materials licenses for existing and expected treatment facilities, untreatable mixed wastes represent a significant proportion of the activity of all mixed waste. Interviews with providers of commercially available treatment facilities indicate that aside from economics, the next most limiting factor in providing

Table 5-1. Untreatable wastes generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Reactive Waste									
Academic 10,000-20,000 Students -- No EPA Classification	Lead- Containing Waste - Organic liquids	Research -- Staining procedure	Liquid	Osmium tetraoxide	0.019	D003	U-238	A	0.000
Industrial -- Manufacturing (50-200 employees on site) -- Large quantity generator (>1,000 Kg/month)	Other -- Metal fines	Cleaning / grinding of magnesium - 2% thorium metal castings	Solid	Metal Cleaning Solutions	9.309	D003	Th-232	A	7.100
Industrial	Other (Mg-Th alloy)	Unknown	Unknown	Mg, Th	3.444	Unknown	Unknown	—	Unknown
Academic 10,000-20,000 Students -- Large quantity generator (>1000 Kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Research	Solid	Potassium cyanide	0.004	D003	S-35	A	0.500
Academic 10,000-20,000 Students -- Large quantity generator (>1000 Kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Research	Solid	Sodium cyanide	0.004	D003	C-136	A	0.500
Industrial -- Research & Development -- Large quantity generator (>1,000 Kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Surplus reagent chemicals and by-products used in chemistry lab setting "lab packs"	Solid Uncompacted	Thorium Nitrate	0.372	D003	Th-232	A	0.102
Metals									
Medical (Non-Federal) -- Hospital 250-750 beds -- Small quantity generator (100-1,000 Kg/month)	Lead-Containing Waste: Shielding	Retired brachytherapy sources in shielded casks. Lead shielding	Solid	Lead	0.233	D008	Cs-137	B	1,180.300
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1000 Kg/month)	Mercury-Containing Waste	Tracer Preservative	Solid	Mercury	0.774	D009	I-125, Co-57	A	75.760

Table 5-2. Summary of generated waste volumes that are not treatable by hazardous constituent group and physical form.

Waste	*Weighted Volume in cubic meters before treatment*						***Total Untreatable Volume***	***Percent Untreatable Volume***
	Aqueous	*Liquid, n.o.s.*	*Absorbed Liquid*	*Solid, n.o.s.*	*Trash*	*Unknown a/*		
Ignitable							0.00	0.00
Corrosive							0.00	0.00
Biological							0.00	0.00
Reactive		0.02		12.75	0.38		13.15	11.09
Characteristic metals				8.50			8.50	7.17
Characteristic organics					1.45		1.45	1.22
F001 & F002	2.81			7.10			9.91	8.36
F003	0.06		0.37				0.43	0.36
F005		3.52					3.52	2.97
P & U listed					2.09		2.09	1.77
Oils							0.00	0.00
Other organics							0.00	0.00
LSC		0.30	1.39				1.69	1.43
Multi-code waste		4.55			73.28		77.83	65.64
Miscellaneous							0.00	0.00
TOTAL VOLUME	2.87	8.39	1.76	28.35	77.21	0.00	118.58	
Percentage of total original volume that is untreatable b/	0.08	0.24	0.05	0.81	2.21			

a/ The volumes of generated wastes for which the physical forms are not known are 368 cubic meters. This volume has not been included in the total volume and percent volume calculations.
b/ The original volume used is 3,496 cubic meters from Table 3-1.
n.o.s. = not otherwise specified.

Table 5-3. Summary of generated waste activity that is not treatable by hazardous constituent group and physical form.

Waste	*Activity in mCi before treatment*						***Total Untreatable Activity***	***Percent Untreatable Activity***
	Aqueous	*Liquid, n.o.s.*	*Absorbed liquid*	*Solid, n.o.s.*	*Trash*	*Unknown a/*		
Ignitable							0.00	0.00
Corrosive							0.00	0.00
Biological							0.00	0.00
Reactive		0.00		7.10	1.10		8.20	0.00
Characteristic metals				85,511.90			85,511.90	49.91
Characteristic organics					30.00		30.00	0.02
F001 & F002	25,000.00			62.40			25,062.40	14.63
F003	1,982.00		100.00				2,082.00	1.22
F005		46,000.00					46,000.00	26.85
P & U listed					0.42		0.42	0.00
Oils							0.00	0.00
Other organics							0.00	0.00
LSC		59.95	147.90				207.85	0.12
Multi-code waste		12,411.24			1.30		12,412.54	7.25
Miscellaneous							0.00	0.00
TOTAL ACTIVITY	26,982.00	58,471.19	247.90	85,581.40	32.82	0.00	171,315.31	
Percentage of total original activity that is untreatable b/	10.46	22.67	0.10	33.18	0.01			

a/ The activity of generated wastes for which the physical forms are not known are 310 mCi. This activity has not been included in the total activity and percent activity calculations.
b/ The original activity used is 257,911 mCi from Table 3-2.
n.o.s. = not otherwise specified.

Table 5-4. Untreatable waste stored as of December 31, 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Reactive									
Academic 10,000-20,000 Students -- No EPA Classification	Lead- Containing Waste	Accumulation for offsite treatment	Liquid	Osmium tetroxide	0.019	D003	U-238	A	0.000
Academic >20,000 Students -- Small quantity generator (100-1,000 Kg/month)	Liquids Aqueous - Solidified	Electron microscopy	Solid	Uranyl nitrate, thorium nitrate	0.038	D003	U-238, Th-232	—	0.080
Industrial -- Manufacturing (50-200 employees on site) -- Large quantity generator (>1,000 Kg/month)	Other -- Metal fines	Casting/cleaning. Storage for generator treatment on-site	Solid	Reactivity III (2)	9.309	D003	Th-232	A	7.100
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 Kg/month)	Mercury-Containing Waste: Elemental mercury	Permanent on-site storage, no treatment or disposal facility	Solid	Mercury	64.143	D003	U-235, U-238	A	255.600
Academic 10,000-20,000 Students -- Large quantity generator (>1,000 Kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Research	Solid	Potassium cyanide	0.004	D003	C-14	A	0.001
Academic 10,000-20,000 Students -- Large quantity generator (>1,000 Kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Research. Unable to treat/ship	Solid	Sodium cyanide	0.004	D003	C-14	A	0.001
Metals									
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 Kg/month)	Other (Specify) -- Chromium Waste - Flammable	Uranium recovery dissolution. Permanent on-site storage, no treatment or disposal facility	Solid	Chromium	29.020	D007	U-235, U-238	A	3,272.600
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1,000 Kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Neutron shield process chemical	Solid	Chromated trash	0.218	D007	H-3, Mn-54, Fe-55, Co-58, Ni-63, Zn-65, Cs-134, Cs-137, Co-60	A	0.000

Table 5-4. Untreatable waste stored as of December 31, 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Government -- Federal (Military) -- Large quantity generator (>1,000 Kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Maintenance and repair of U.S. Navy ships, no mixed waste treatment or disposal	Solid	Chromate	2.834	D007	Co-60	A	0.000
Government -- Federal (Research & Development) -- Small quantity generator (100-1,000 Kg/month)	Irradiated Reactor or Pool Components	Spent reactor control rods (cadmium); permanent on site storage	Uncompacted solid	Cadmium	0.034	D006	Cd-109, Ag-109m, Cd-113m, Fe-55, Co-60	B	84,000.000
F003									
Academic >20,000 Students -- Large quantity generator (>1,000 Kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Lab Research/Biomedical. On site storage for decay and permanent on-site storage (indefinite)	Compacted solid	Acetonitrile, methanol, phenol, chloroform	0.573	D001, F003	H-3, C-14, P-32, S-35, I-125, Na-22, Ce-141	A	25.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity reactor (>1,000 Kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Accumulation for future treatment/ shipment	Aqueous	Acetone	0.145	F003	Co-58, Co-60, Mn-54	A	4,624.000
P & U									
Academic <10,000 Students -- No EPA Classification	Other - (specify) - Solid Beryllium	Cf252, Np237, Am241, Ra226 open sources for which we were seeking disposal	Solid	Beryllium	0.484	P015	Pu-239	A	6,000.000
Industrial -- Research & Development -- Small quantity generator (100-1,000 Kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Page cells. Stored for accumulation prior to shipment - Decay	Solid	Acrylamide, sodium azide	0.047	U007, P105	S-35, I-125	A	5.000

Table 5-4. Untreatable waste stored as of December 31, 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
LSC									
Industrial -- Research & Development	Liquids Scintillation, containing radio-isotopes other than C-14 and/or tritium -- (fluids or vials)	Awaiting shipment for disposal	Solid	Alkylbenzene	0.019	F005	C-14	A	12.100
Multi-Code									
Academic <10,000 Students -- No EPA Classification	Lead Containing Waste -- Aqueous Liquids	Staining procedures	Liquid	Osmium, lead	0.019	P087, D008	U-238	A	0.000
Academic <10,000 Students -- Small quantity generator (100-1,000 Kg/month)	Liquids Organic - (Solvents, Chlorinated Solvents, etc.)	Unable to dispose of waste due to organic contents	Absorbed liquid	Methanol, benzene, chloroform	0.084	D022, F003	H-3, C-14, Ni-63	A	3,175.000
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1,000 Kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Mixed waste interim status TSDF awaiting treatment and/or disposal technology	Solvent liquid	Ignitable, reactivity, mercury, barium, lead, chromium, chloroform, 1,1-dichloro-ethylene, tetrachlo-roethylene, dichloroethane, cadmium, methyl ethyl ketone	3.487	D001, D003, D009, D008, D005, D007, D022, D029, D039, D040, D028, D006, D035	Co-60, Cs-137, Ni-63, Ni-59, Fe-59, Co-58, Fe-55, Mn-54, Sr-90, Nb-95, Tc-99, Cs-134, Sr-89, Pm-147	A	0.000
Industrial -- Manufacturing (>200 employees) -- Conditionally exempt small quantity generator (<100 Kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Storage on-site for decay/storage for accumulation. Unable to dispose. Expired	Liquid	Corrosivity, Reactivity, EP toxic	3.430	D002, D003, D004-32	H-3, C-14	A	43,000.000
Government -- Federal (Research & Development) -- Large quantity generator (>1,000 Kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Decay, incineration, accumulation for lower cost	Solid	Unknown	1.499	D001, D002, D003, F001, F003, F005, U022, U168	H-3, C-14, I-125, S-35	A	3.500

Table 5-4. Untreatable waste stored as of December 31, 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Research and Development -- Small quantity generator (100-1,000 Kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Biochemistry protein assays. Storage of P-32 contaminated lab trash for decay. Having difficulty disposing of the waste	Uncompacted Solid	Toluene, Granite Salt	2.095	F005 P030	C-14	A	0.415
Misc									
Industrial -- Manufacturing (<50 employees on site) -- Large quantity generator (>1,000 Kg/month)	Other -- (Specify)	On-site storage for accumulation - For shipment or treatment	Bulk Liquid	Hazardous Waste Liquid	5.204	Unknown	C-14	—	275,000.00
Industrial -- Research & Development -- Small quantity generator (100-1,000 Kg/month)	Solidified Evaporator Bottoms/Concentrates/ Sump Sludge	Storage for accumulation - for future shipment	Liquid	Pesticides	0.002	Unknown	C-14	A	3,000.000
Industrial -- Research & Development -- Small quantity generator (100-1,000 Kg/month)	Liquids Aqueous -- Solidified	From biochemical and environmental fate studies. Storage for accumulation - for future shipment	Liquid/ Solidified	Pesticides	0.186	Unknown	C-14	A	100.000
					122.895				422,480.397

Table 5-5. Summary of stored waste volumes that are not treatable by hazardous constituent group and physical form.

Waste	*Weighted volume in cubic meters before treatment*						***Total Untreatable Volume***	***Percent Untreatable Volume***
	Aqueous	*Liquid, n.o.s.*	*Absorbed Liquid*	*Solid, n.o.s.*	*Trash*	*Unknown a/*		
Ignitable							0.00	0.00
Corrosive							0.00	0.00
Biological							0.00	0.00
Reactive		0.02		73.49	0.01		73.52	59.82
Characteristic Metals				32.11			32.11	26.12
Characteristic Organics							0.00	0.00
F001 & F002							0.00	0.00
F003	0.15				0.57		0.72	0.58
F005							0.00	0.00
P & U Listed				0.48	0.05		0.53	0.43
Oils							0.00	0.00
Other Organics							0.00	0.00
LSC				0.02			0.02	0.02
Multi-Code Waste	0.02	6.92	0.08		3.59		10.61	8.64
Miscellaneous		5.21	0.19				5.39	4.39
TOTAL VOLUME	0.16	12.14	0.27	106.10	4.22	0.00	122.90	
Percentage of original volume that is untreatable b/	0.01	0.90	0.02	7.88	0.31			

a/ The volumes of stored wastes for which the physical forms are not known are 8 cubic meters. This volume has not been included in the total volume and percent volume calculations.
b/ The original volume used is 1,346 cubic meters from Table 3-3.
n.o.s. = not otherwise specified

Table 5-6. Summary of stored waste activity that is not treatable by hazardous constituent group and physical form.

Waste	*Activity in mCi before treatment*						***Total Untreatable Activity***	***Percent Untreatable Activity***
	Aqueous	*Liquid, n.o.s.*	*Absorbed Liquid*	*Solid, n.o.s.*	*Trash*	*Unknown a/*		
Ignitable							0.00	0.00
Corrosive							0.00	0.00
Biological							0.00	0.00
Reactive		0.00		262.78			262.78	0.06
Characteristic Metals				87,272.60			87,272.60	20.66
Characteristic Organics							0.00	0.00
F001 & F002							0.00	0.00
F003	4,624.00				25.00		4,649.00	1.10
F005							0.00	0.00
P & U Listed				6,000.00	5.00		6,005.00	1.42
Oils							0.00	0.00
Other Organics							0.00	0.00
LSC				12.10			12.10	0.00
Multi-Code Waste	0.00	43,000.00	3,175.00		3.92		46,178.92	10.93
Miscellaneous		278,000.00	100.00				278,100.00	65.83
TOTAL ACTIVITY	4,624.00	321,000.00	3,275.00	93,547.48	33.92	0.00	422,480.40	
Percentage of original activity that is untreatable b/	1.06	73.57	0.75	21.44	0.01			

a/ The activity of stored wastes for which the physical forms are not known are 15 mCi. This activity has not been included in the total activity and percent activity calculations.
b/ The original activity used is 436,345 mCi from Table 3-4.
n.o.s. = not otherwise specified

treatment for mixed waste is air emissions, especially for ^{14}C and ^{3}H. With their proximity to off-site populations, most commercial treatment facilities are technologically unable to manage larger quantities of ^{14}C and ^{3}H without generating even larger volumes of secondary mixed waste.

6. SUMMARY OF WASTE MANAGEMENT OPTIONS

Most, but not all, mixed waste can be treated by commercially available technology. Of the 3,496 cubic meters of mixed waste generated in 1990, all but 118 (3.4%) can be treated. Table 6-1 summarizes the available treatment. This estimate is considerably lower than the 336 cubic meter value estimated in the National Profile. The main reasons for these differences are the advent of new technologies and management techniques (steam reforming and blending of low-activity, high-Btu content waste) and use of a different methodology for sorting and evaluating combinations of waste code and physical form. Table 3-1 summarizes the wastes that were generated in 1990. Of those wastes, the untreatable wastes are identified and summarized in Tables 5-1 and 5-2, respectively. In addition to untreatable wastes, treatment residues of listed wastes are required to be managed as listed waste under the derived-from rule currently in effect. These derived-from wastes, estimated as 1% of 1990 stored and generated listed waste, constitute an additional 6.26 cubic meters.

In order for the currently untreatable wastes to be land disposed, one or more of the following regulatory options must be successfully pursued:

- Treatability variance
- Finding of equivalent treatment
- No migration petition.

If none of these regulatory options is available and the waste remains untreated, the waste will be banned from land disposal.

In addition to untreated and derived-from wastes, approximately 38 cubic meters of the generated mixed waste has been insufficiently characterized to enable an estimate of waste treatment. Depending on the eventual characterization of these wastes, additional untreatable or derived-from wastes can be expected. Because of the uncertainties associated with this waste, it is conservatively estimated that no more than 4 cubic meters (10%) of this waste will be untreatable.

In summary, commercially generated waste volumes that may require land disposal in a jointly regulated mixed waste disposal facility each year have the following components:

Waste Type	Estimated Volume (cubic meter/year)
Currently untreatable waste (Acceptable for disposal only after regulatory option is successful)	118
Waste residues derived from listed waste (estimated)	6
Contribution from poorly characterized waste (estimated)	4
TOTAL	128

It should be remembered that an additional 123 cubic meters of mixed waste was in storage in 1990.

Several regulatory options could potentially be used to eliminate the need to dispose of mixed waste in jointly regulated facilities, or to reduce the cost of treatment or disposal. With a delisting petition, generators may petition EPA to exclude a waste from regulation under RCRA. Where the petition is successful, the wastes can be disposed of as nonhazardous waste, outside the RCRA jurisdiction. In the case of mixed waste, such disposal could be in a low-level radioactive waste disposal facility regulated solely under the AEA, with state and facility approval. Discussions with EPA officials, however, indicate that petition approvals are difficult to obtain. Economic evaluations indicate that delisting is practical only if applied to large volumes of waste, typical of those at treatment facilities.

With regard to no migration variances, EPA staff have indicated that facilities meeting NRC and RCRA design requirements may meet no migration standards, and that storage in such units would not be subject to the one-year storage standard. EPA staff emphasized the difficulty in obtaining the variance, as only 1 of 31 petitions has been granted. In addition, waste disposed of in such facilities would still be required to meet 10 CFR 61 waste form requirements before disposal. The usefulness of this approach has diminished with the issuance of EPA policy allowing storage of greater than one year for generators of small amounts of mixed waste.

Variances for alternative treatment standards are also difficult to obtain. Of 25 petitions received by EPA, three have been granted. Estimated costs for preparation are $40,000. Treatability variances, however, are intended to address technological problems associated with meeting treatment standards for unconventional wastes.

Determination of Equivalent Treatment Petitions may be a more viable alternative than treatability variances. According to EPA personnel, they are more common than treatability variance petitions, and more likely to be granted by the agency. High-activity wastes may be candidates for either the treatability variance or the Equivalent Treatment Petition because the radioactivity becomes a dominant technological consideration in management of these wastes.

Untreatable wastes constitute a very small percentage of generated and stored mixed waste volumes. However, because of the limitations imposed by radioactive materials licenses for existing and expected treatment facilities, untreatable mixed wastes represent a significant proportion of the activity of all mixed waste.

Table 6-1. Summary of available treatment alternatives.

Treatment Alternatives	Processes Available	Radioactive Material License	RCRA Part B Permit
Diversified Scientific Services, Inc. Kingston, Tennessee	Solvent Processing	Yes	Yes
	Combustion	Yes	Yes
Envirocare of Utah Salt Lake City, Utah	Land Disposal	Yes	Yes
	Stabilization	Yes	Yes
	Size Reduction	Yes	Yes
	Chemical Oxidation	Yes	Yes
	Chemical Reduction	Yes	Yes
	Neutralization	Yes	Yes
	Macroencapsulation	Yes	No
Perma-Fix of Florida Gainesville, Florida	Liquid Scintillation Vial Processing	Yes	Yes
	Combustion	Yes	Yes
NSSI/Recovery Services Houston, Texas	Fuel Blending	Yes	Yes
	Stabilization	Yes	Yes
	Size Reduction	Yes	Yes
	Chemical Oxidation	Yes	Yes
	Chemical Reduction	Yes	Yes
	Neutralization	Yes	Yes
	Filtration/Separation	Yes	Yes
	Waste Consolidation	Yes	Yes
	Absorption	Yes	Yes
	Solvent Recycling	Yes	Yes
Scientific Ecology Group Oak Ridge, Tennessee	Incineration	Yes	No
	Steam Reforming	Yes	No

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Appendices A-1 through A-15

Wastes Generated in 1990

Table A-1. Ignitable waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radio-nuclides	NRC Class	Cumu-lative Activity (mCi)
Industrial -- Research & Development -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Aqueous -- Absorbed	Waste from research activities	Liquid Absorbed		0.281	D001	In-111, I-125	A	0.000
Academic 10,000-20,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Research sample prep - absorbents spent reagents (contains C-14)	Absbd liquid/solid	Formaldehyde	0.076	D001	C-14	A	0.2
Industrial -- Large quantity generator (>1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Generated by analytical practices	Aqueous	Organics	0.306	D001			
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from research	Aqueous	Formaldehyde	0.021	D001			
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from research	Aqueous	Methanol	0.042	D001			
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from research	Aqueous	Ethanol	0.063	D001	H-3, C-14, P-32, S-35	A	1
Academic >20,000 students - Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Extraction solvents from labs	Bulk	Various alcohols	0.057	D001	H-3, C-14, P-32	A	0.1
Academic <10,000 Students - Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Laboratory counting procedures, waste from research	Bulk Liquid	TNT	0.316	D001	C-14	A	0.006
Academic <10,000 Students - Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Laboratory counting procedures, waste from research	Bulk Liquid	TNT	0.316	D001	C-14	A	0.006
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generator (100-1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Abandoned Decommissioned Parts Washer	Bulk liquid	Waste flammable liquid N.O.S.	0.203	D001	Co-60, Co-58, Cs 134, Cs-137, Mn 54		0.002
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generated (100-1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Cleaning solvent	Bulk liquid	Petroleum distillate	0.073	D001			

Table A-1. Ignitable waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radio-nuclides	NRC Class	Cumu-lative Activity (mCi)
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.) -- Flammable	Paint solvent/waste	Bulk liquid	Flammable solvents	1.017	D001	Co-60, Cs-137		1.000
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.) -- Flammable	Paint/solvent waste	Bulk liquid	Flammable solvents	13.802	D001	Co-60, Mn-54		780.030
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Lab research. Liquid organic deregulated	Bulk Liquid	Ignitability	0.372	D001	H-3, C-14	A	215.000
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Laboratory counting procedures	Bulk Liquid	Tetrahydrofuran	0.698	D001	H-3	A	0.007
Medical (Non-Federal) -- Medical College/Hospital -- Small quantity generator (100-1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Research waste	Bulk Liquid	Ignitable	0.078	D001	S-35, P-32	A	5.000
Industrial -- Research and Development -- Small quantity generator (100-1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Spent reagents	Bulk Liquid	Flammable Liquid	0.035	D001	C-14	A	3.000
Academic <10,000 Students - Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Used for laboratory counting procedures	Bulk liquid	Petroleum distillates	0.168	D001	H-3	A	0.011
Medical (non-Federal) -- Research -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from biomedical research	Bulk liquid	Ignitable	0.631	D001	H-3, C-14, P-32, S-35, I-125	A	358.4
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from research and service contract	Bulk Liquid	Formamide	0.034	D001	P-32	A	0.000
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from research and service contract	Bulk Liquid	Formamide	0.071	D001	S-35	A	0.000

Table A-1. Ignitable waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radio-nuclides	NRC Class	Cumu-lative Activity (mCi)
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.) - Flammable	Laboratory Counting Procedure	Bulk liquid	Acetonitrile	0.076	D001	I-125	A	10
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.) -- Flammable	Paint solvent waste	Bulk Liquid	Flammable Solvents	1.613	D001	Co-60, Cs-134, Cs-137		0.001
Academic >20,000 students - Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.) -- Short lived liquid form stored for decay (bottles in drums - Laboratory Waste)	Research laboratories	Bulk liquid	Ethanol	0.011	D001			
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Paint waste, degreasing	Liquid	Isopropanol, acetone, methyl ethyl ketone	0.596	D001	Mn-54, Co-60	A	2.759
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Aqueous -- Absorbed	Research	Liquid	Ethanol	0.038	D001	H-3, C-14	A	20
Government -- Federal (Research & Development) -- Large quantity generator (>1000 kg/month)	Liquids Organic - (Solvents, chlorinated Solvents, etc.) -- Flammable	Biomedical research	Liquid	Flammable liquids	32.977	D001			
Academic 10,000-20,000 Students - No EPA Classification	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Animal colony wastes	Liquid	Organic solvent	0.042	D001	H-3, S-35, P-32	A	5
Industrial -- Research and Development -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	HPLC waste	Liquid	Acetonitrile	0.281	D001	H-3, C-14, S-35	A	11
Industrial -- Research & Development	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Laboratory experiments	Liquid	Acetonitrile	1.489	D001			
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Liquid waste from equipment clean-up and radiotracer tests	Liquid	Various Alcohol	0.372	D001	C-14	A	100.000

Table A-1. Ignitable waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radio-nuclides	NRC Class	Cumu-lative Activity (mCi)
Academic <10,000 Students - Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Research -- Superfund soil remediation	Liquid	Coal Tars, naphthalene	0.191	D001	C-14, H-3	A	0.5
Academic <10,000 Students	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)		Liquid	CIS-2-pentene	0.019	D001	Na-22	A	1
Medical (Non-Federal) -- Hospital >750 beds -- Large quantity generator (>1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.) -- Flammable	Research	Liquid	Characteristic Hazard	11.401	D001	C-14, P-32, I-125		0.000
Medical (Non-Federal) -- Research -- Large quantity generator (>1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Ethanol extractions from research	Organic Liquid	Ignitable	0.004	D001	P-32	A	0.200
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Miscellaneous solvents, laundry still bottoms, solvent soaked rags	Solid	Ignitable solvent rags	0.218	D001	Cs-137, Cs-134, Co-60, Mn-54, Co-58, Fe-55	A	0.050
Academic >20,000 students - Large quantity generator (>1000 kg/month)	Paint	Paint waste	Solid	Paint waste	0.023	D001	Co-60	A	0
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Paint: Oil-based	Painting activities, excess / out of spec..	Solid / liquid	Ignitable liquid	0.029	D001	Co-60, Cs-134, Cs-137		0.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- (Specify) -- Adhesives	Miscellaneous maintenance activities	Solid / semi-solid	Ignitable adhesives	0.218		Co-60, Fe-55, Cs 134, Cs-137, Mn 54, Co-58	A	0.005
Academic <10,000 Students - Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Waste from research, cleaning of laboratory equipment	Uncompacted solid	TNT	0.421	D001	C-14	A	0.005

Table A-2. Corrosive waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Aqueous -- Solidified -- Noah solution	Plant maintenance	Aqueous	NA OH solution	0.872	D002	Co-60, Co-58, Fe 55	A	0.680
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- (Specify) -- Parkerizing fluid	Corrosion treatment for reactor vessel studs	Aqueous	Parkerizing solution	0.872	D002	Co-60, Co-58, Fe 55	A	0.680
Medical (Non-Federal) -- Research -- Large quantity generator (>1,000 kg/month)	Other -- (Specify)	Inorganic acid solutions from research	Aqueous Liquid	Corrosive	0.019	D002	H-3, P-32, I-125	A	13.000
Academic >20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Aqueous -- Absorbed	Waste from research activities	Bulk Liquid	Corrosive	0.038	D002	H3, C14	A	5
Industrial -- Decontamination facility & waste reduction	Liquids Aqueous -- Absorbed		Bulk Liquid	Acid	0.046	D002		A	0.000
Academic >20,000 students	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Research waste	Bulk liquid	PO-58 P115 acids	0.084	D002	Uranium and thorium	A	0
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- (Specify) -- Corrosive liquids	Maintenance activities	Bulk liquid	Corrosive liquid	0.218	D002	H-3	A	0.208
Academic >20,000 Students -- Large quantity generator (>1000 kg/month)	Acids	Research	Liquid	Acetic acid	0.287	D002	I-125	A	0.024
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Aqueous -- Absorbed	Research	Liquid	Phosphoric acid	0.115	D002	P-32	A	25
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Aqueous -- Absorbed	Research	Liquid	Sulfuric acid	0.076	D002	S-35	A	45
Government -- Federal (Research & Development) -- Large quantity generator (>1000 kg/month)	Liquids Organic - (Solvents, chlorinated Solvents, etc.) -- Flammable	Biomedical research	Liquid	Acids	32.977	D002			

Table A-2. Corrosive waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1000 kg/month)	[illegible] -- Phosphoric Acid (Corrosive)	Electropolisher	Liquid	Phosphoric acid	1.308	D002	Co-60, Cs-137, Mn-54	A	0.000
Government -- Federal (Research & Development) -- Conditionally exempt small quantity generator (<100 kg/month)	Other - (specify)	Lab paraphernalia from research studies for decay. Concentrated contaminated acids	Liquid	Corrosive	0.052	D002	H-3, C-14	A	0.475
Academic <10,000 Students -- Large quantity generator (>1000 kg/month)	Other - (specify) - Liquids aqueous	Discarded radiochemicals used in research	Liquid - small vials	Various	0.021	D002	H-3, C-14	A	15
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1,000 kg/month)	Other - (Specify)	Electropolisher filters.	Solid	Electropolisher filters	0.654	D002	Co-60, Cs-137, Fe-55, Zn-65		4.500
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Research	Solid	HCL	0.038	D002	P-32	A	6
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Research	Solid	Phos acid	0.038	D002	C-14	A	0.001
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Research	Solid	Sulfuric acid	0.038	D002	C-14	A	0.001
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Laboratory waste (gloves, paperliners, etc.) from chromatograph gels	Solid	Phenol	1.263	D002	H-3, P-32, I-125, S-35	A	50
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Filter Media -- Dewatered	Uranium Recovery waste	Uncompacted Solid	Corrosive D002	39.572				
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1000 kg/month)	Filters, Mechanical	Electropolisher Filter	Uncompacted solids	Acid filters	0.494	D002	Co-60, Cs-137, Mn-54	A	0.000

Table A-3. Biological waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic 10,000-20,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Biological Waste (Non-infectious)	S35	Absorbed	Deoxyadenosine 5' - (A-thio) triphosphate	0.057				
Academic 10,000-20,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Biological Waste (Non-infectious)	Spent reagents - lab counting procedures (contains I-125)	Absorbed	Tyrosine	0.191	D001	I-125	A	0.002
Industrial -- Sealed Source/Gauge/Instrument User	Other Biological waste (Non-infectious)	Excrete from research animals	Bulk Liquid	Urine and Feces	1.396		C-14, H-3		50.000
Medical (Non-Federal) -- Research -- Large quantity generator (>1,000 kg/month)	Animal Carcasses containing C-14 and/or tritium (Non-infectious)	Lab animals used for research	Solid	Animal Carcasses	0.233		H-3, C-14, Ca-45	A	26.440
Medical (Non-Federal) -- Research -- Large quantity generator (>1,000 kg/month)	Animal Carcasses containing radioisotopes other than C-14 or tritium (Non-infectious)	Lab animals used for research	Solid	Animal Carcasses	0.078				
Academic >20,000 students - Large quantity generator (>1000 kg/month)	Biological Waste (Non-infectious)	Lab research and instruction	Solid	Biological waste	0.034		H-3, C-14	A	0
Industrial -- Research & Development -- Conditionally exempt small quantity generator (<100 kg/month)	Biological Waste (Non-infectious)	Waste from research activities	Solid	Biological Waste	1.055	D001	In-111	A	0.000
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Other biological waste	Cell cultures	Uncompacted solid	Biological waste	0.764		P-32, S-35		100
Industrial -- Sealed Source/Gauge/Instrument User	Animal carcasses containing C-14 and/or tritium	Research animals	Uncompacted Solid	Carcasses	1.396		C-14, H-3		50.000

Table A-4. Reactive waste generated in 1990. 1 of 1

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic 10,000-20,000 Students -- No EPA Classification	Other biological waste	Research	Liquid	Formaldehyde	0.191	D003	H-3	A	0.026
Academic 10,000-20,000 Students -- No EPA Classification	Lead-Containing Waste - Organic liquids	Research -- Staining procedure	Liquid	Osmium tetraoxide	0.019	D003	U-238	A	0.00003
Industrial -- Manufacturing (50 200 employees on site) -- Large quantity generator (>1,000 kg/month)	Other -- Metal fines	Cleaning / grinding of magnesium - 2% thorium metal castings	Solid	Metal Cleaning Solutions	9.309	D003	Th-232	A	7.100
Industrial	Other (Mg-Th alloy)			Mg, Th	3.444				
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Research	Solid	Potassium cyanide	0.004	D003	S-35	A	0.5
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Research	Solid	Sodium cyanide	0.004	D003	C-136	A	0.5
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Surplus reagent chemicals and by products used in chemistry lab setting "lab packs"	Solid Uncompacted	Thorium Nitrate	0.372	D003	Th-232	A	0.102

Table A-5. Characteristic metals waste g nerated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic >20,000 students	Other - Arsenic and 32P			Arsenic	0.051	D004	P-32		
Industrial	Other (Specify) -- Barium, Lead			Barium, Lead	24.623				
Industrial -- Manufacturing (50-200 employees on site) -- Large quantity generator (>1,000 kg/month)	Liquids Aqueous - Absorbed -- Toxic	Radioanalytical laboratory procedures, laboratory counting procedures	Uncompacted Solid	Lead	1.396	D008	H-3, K-40	A	0.000
Academic 10,000-20,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Cr-51	Absorbed liquid	Chromate	0.065	D007	Cr-51	A	0.1
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Aqueous -- Absorbed	Decontamination	Aqueous	Lead, mercury, barium, chromium	0.291	D008, D009, D005, D006, D007	Co-60, Cs-137	A	0.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Aqueous -- Solidified	System maintenance	Aqueous	Chromate	0.872	D007	Co-60, Co-58, Fe 55	A	0.680
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Aqueous -- Absorbed	Education and research	Aqueous	Metals	0.382		I-125		50
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity reactor (>1000 kg/month)	Mercury Containing Waste (Liquids)	Lab Analysis	Aqueous	Mercury	0.043	D009	Co-60, Cs-134, Cs-137	A	0.000
Nuclear Reactor Facility -- Pressurized Water Reactor	Mercury-Containing Waste (Liquids)	Laboratory analysis	Aqueous	Mercury	0.039	D009	Co-60, Cs-137	A	0.040
Industrial -- Large quantity generator (>1,000 kg/month)	Other -- (Specify) -- Aqueous Metal Mixture	Generated by analytical practices	Aqueous	Metal Mixture	8.006				
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generator (100-1000 kg/month)	Other -- (Specify) -- Chromate	Plant component cooling system	Aqueous	Chromate	0.436	D007	Co-60	A	0.019

Table A-5. Characteristic metals waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Large quantity generator (>1,000 kg/month)	Other -- (Specify) -- Mixed Waste - Aqueous Metal Mixture	Generated by analytical practices	Aqueous	Metal Mixture	9.568		H-3, U-238, Th-122	A	1.500
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- (Specify) -- Chromated Water	Leaks / maintenance on chromated water systems	Bulk liquid	Cromated water	0.436	D007	Co-60, Fe-55, Cs 134, Cs-137, Mn 54	A	0.002
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil	RCP's, SIS, changing pumps (any pumps requiring oil)	Bulk liquid	Lead, chromium, selenium	0.668	D008, D007, D010			
Government -- Federal (Research & Development) -- Large quantity generator (>1000 kg/month)	Lead-Containing Aqueous liquids	Biomedical research	Liquid	Aqueous liquid-lead	0.083	D008	U-238	A	1
Academic <10,000 Students -- No EPA Classification	Lead-Containing Waste -- Aqueous liquids	Uranyl acetate misted with lead citrate and osmium oxide. Staining procedure.	Liquid	Osmium oxide, lead citrate	0.019	D003, D008	U-238	A	0
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Aqueous -- Absorbed	Research	Liquid	Sodium chromate	0.038	D007	Cr-51	A	4
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Paint solvents, Paint thinner. 27.3 FT3 (Waste shipped January 1991 to licensed waste processor)	Liquid	Lead, Mercury, Cadmium	0.793	D008, D009, D006	Mn-54, Co-60, Fe-55, Fe-59, Co-58, Ni-63, H-3, I-129, C-14	A	0.021
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1,000 kg/month)	Mercury-Containing Waste: Elemental mercury	Level indications, barometer	Liquid	Mercury	0.029	D009	Co-60, Cs-137, Mn-54	A	0.000
Medical (non-Federal) --Research - Large quantity generator (>1000 kg/month)	Other -- Specify (Liquid Chromium)	Biomedical research	Liquid	Chromium	0.001	D007	Cr-51	A	1

Table A-5. Characteristic metals waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Research & Development -- Small quantity generator (<100-1000 kg/month)	Biological Waste (Non-infectious)	Autoradiography	Liquid/Solid	Mercury	0.698	D009	H-3, C-14	A	0.470
Academic >20,000 students -- No EPA Classification	Lead-Contaminated trash	Precipitated	Noncompacted Solid	Lead	0.168	D008	Pb-210	A	0.003
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- (Specify) -- Oil/water separator sludge	Wastewater treatment (OWS)	Sludge	Cr, Pb. Va	4.940		Co-60, Cs-137		0.010
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- (Specify) -- Surface Impoundment sludge	Wastewater treatment (SI)	Sludge	Pb, Ni, Va	28.331		Co-60, Cs-137		0.005
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Ion Exchange Resins -- Dewatered	Ion-exchange of process liquids and liquid effluents from treatment of chromated water.	Solid	Ion exchange resin containing chromium	0.218	D007	Co-60, Fe-55, Cs 134, Cs-137	A	0.003
Academic <10,000 Students -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste	Activated by Cyclotron in 1960's - discovered in 1990	Solid	Lead	0.191	D008	Bi-207	A	10
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Lead-Containing waste	Blankets, sheeting, and pellets used for shielding	Solid	Lead	0.291	D008			
Government -- Federal (Military) -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste	Maintenance and repair of U.S. Navy ships	Solid	Lead	4.894	D008	Co-60	A	0
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste	Shielding	Solid	Pb	0.023	D008	C0-60, uranium (nat)	A	0
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1000 kg/month)	Lead-Containing Waste - Other	Shavings from lead bricks	Solid	Lead	0.058	D008	Co-60, Cs-137	A	0.000

Table A-5. Characteristic metals waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1000 kg/month)	Lead-Containing Waste - Sheeting	Shielding	Solid	Lead	0.581	D008	Co-60, Cs-137	A	0.000
Industrial -- Research & Development -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste. Lead shielding.	I125 contaminated shielding	Solid	Lead	0.931	D001	I-125	A	10.000
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1000 kg/month)	Lead-Containing Waste: Batteries	High Lift Equip	Solid	Battery	0.015	D008			
Nuclear Reactor Facility -- Pressurized Water Reactor	Lead-Containing Waste: Blankets	Damaged shielding	Solid	Lead	0.218	D008	Co-60, Cs-137	A	0.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste: Blankets	Plant maintenance	Solid	Lead	0.218	D008	Co-60, Co-58, Fe 55	A	0.170
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste: Blankets	Shielding	Solid	Lead	0.436	D008	H-3, Fe-55, Ni-63, Co-60, Nb-95, Cs-137, Cs-134, Co-58, Mn-54	A	0.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generator (100-1,000 kg/month)	Lead-Containing Waste: Other	Penetration sealant	Solid	Lead	0.436	D008	Co-60, Cs-137	A	0.000
Academic 10,000-20,000 Students Large quantity generator (>1000 kg/month)	Lead-Containing Waste: Shielding	Contaminated shielding	Solid	Lead	0.026	D008	Cs-137	A	0.01
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1,000 kg/month)	Lead-Containing Waste: Shielding	Contaminated shielding	Solid	Lead	0.174	D008	Co-60, Cs-137, Mn-54	A	0.000

Table A-5. Characteristic metals waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Medical (Non-Federal) -- Hospital >750 beds -- Large quantity generator (>1,000 kg/month)	Lead-Containing Waste: Shielding	Patient diagnostic procedures, laboratory counting procedures, biomedical research, equipment quality control	Solid	Metallic Lead	0.027	D008	Pm-147	A	0.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste: Shielding	Pipe penetration shielding	Solid	Lead	1.090	D008	H-3, Fe-55, Ni-63, Co-60, Nb-95, Cs-137, Cs-134, Co-58, Mn-54	A	0.000
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste: Shielding	Research	Solid	Lead	0.459	D008	P-32, Na-22	A	1
Academic >20,000 students	Lead-Containing Waste: Shielding	Research. / Lead shielding contaminated.	Solid	Lead	0.004	D008	P-32, I-125	A	0.01
Medical (Non-Federal) -- Hospital 250-750 beds -- Small quantity generator (100-1,000 kg/month)	Lead-Containing Waste: Shielding	Retired brachytherapy sources in shielded casks. Lead shielding	Solid	Lead	0.233	D008	Cs-137	B	1,180.300
Academic >20,000 Students -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste: Shielding	Waste from research activities	Solid	Lead Shielding	0.038	D008	I125	A	5
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1000 kg/month)	Mercury-Containing Waste	Tracer Preservative	Solid	Mercury	0.774	D009	I-125, Co-57	A	75.76
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1000 kg/month)	Mercury-Containing Waste (Solids)	Glass - contaminated	Solid	Mercury	0.070	D009	Th-232	A	0.24

Table A-5. Characteristic metals waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Mercury-Containing Waste: Elemental mercury	Lab analytical process and maintenance	Solid	Mercury	7.387	D003	U-235, U-238	A	255.600
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Other (Specify) -- Chromium Waste - Flammable	U-recovery dissolution and calcination process	Solid	Chromium	18.203	D007	U-235, U-238	A	3,272.600
Industrial -- Manufacturing (50-200 employees on site) -- Large quantity generator (>1,000 kg/month)	Other -- Metal fines	Melting and processing of magnesium - 2% thorium metal	Solid	Barium	69.819	D005	Th-232	A	30.000
Industrial -- Waste Broker/Processor -- Large quantity generator (>1,000 kg/month)	Incinerator Ash or Residuals	Incinerator ash of LLRW	Solid/Ash	Cadmium, Chromium, Lead	76.683	D006, D007, D008	Co-60, Cs-137, Fe-55	A	0.000
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Irradiated Reactor or Pool Components	Spent reactor control rods	Uncompacted solid	Cadmium	0.034	D006	Cd-109, Ag-109m, Cd-113m, Fe-55, Co-60	B	84000
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Lead-Containing Waste -- Shielding	Unable to treat, ship, or dispose of the waste. Lead inside activated shielding components.	Uncompacted solid	Lead	0.687	D008	Co-60, Mn-54	A	0.5
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste	Research waste	Uncompacted solid	Lead	0.287	D008			
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste -- Other	Ash from station stack	Uncompacted solid	Lead	2.789	D008	Co-60, Cs-137		1.000

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Manufacturing (50-200 employees on site) -- Conditionally exempt small quantity generator (<100 kg/month)	Lead-Containing Waste: Lead-contaminated trash	Manufacture of optical filters. Thin film evaporator	Uncompacted Solid	Lead	4.189	D008	Th-232	A	0.220
Industrial	Lead-Containing Waste			Lead	7.035	D008			
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Sandblasting. Plant maintenance and decontamination activities at nuclear powered generating utility	Uncompacted solid	Gritblast	0.218	D006	Co-60, Cs-137, Cs-134	A	2.310
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Research	Solid	Chromium	0.038	D007	Cr-51	A	0.5
Government -- Federal (Military) -- Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Maintenance and repair of U.S. Navy ships	Solid	Chromate	2.834	D007	Co-60	A	0

Table A-6. Characteristic organics waste generated in 1990. 1 of 2

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic >20,000 students - Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Biomedical Research laboratory	Compacted solid	Acetronotrile, chloroform, methanol	1.452	D001, D022	H-3, C-14, S-35	A	30
Academic 10,000-20,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Organic (Solvents, Chlorinated Solvents, etc.)	DNA Extraction experiments	Solid	Chloroform	0.071	D022	P-32	A	1
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Aqueous -- Absorbed	Research	Liquid	Chloroform	0.038	D022	H-3	A	15
Industrial -- Research & Development -- Conditionally exempt small quantity generator (<100 kg/month)	Liquid Organic - (Solvents, Chlorinated Solvents, etc.) -- Toxic	Waste from research - DNA extractions	Bulk Liquid	Chloroform	0.002	D022	P-32	A	0.300
Industrial -- Research and Development -- Small quantity generator (100-1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Cleaning of equipment and contaminated components. HPLC tests	Bulk Liquid	Chloroform	0.018	D022	H-3	A	1.000
Government -- Federal (Research & Development) -- Large quantity generator (>1000 kg/month)	Liquids Organic - (Solvents, chlorinated Solvents, etc.) -- Flammable	Biomedical research	Liquid	Chloroform	32.977	D022			
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from the manufacture of labeled compounds	Liquid	Organic solvents	2.886	D022, D001	H-3	A	45561.9
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Aqueous -- Solidified	From biochemical and environmental fate studies	Liquid	Pesticides	0.186		C-14	A	100.000

Table A-6. Characteristic organics waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Solidified Evaporator Bottoms/Concentrates/Sump Sludge	Concentrates/sludges. From organic synthesis of labeled compounds	Liquid	Pesticides	0.002		C-14	A	3,000.000
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Other biological waste (Non-infectious)	Plant and animal waste (milk, eggs, urine, feces) from biochemical studies	Liquid and Solid	Pesticides	0.512		C-14	A	100.000
Academic >20,000 students - Conditionally exempt small quantity generator (<100 kg/month)	Liquids organic - (Solvents, Chlorinated Solvents, etc.) - Reactive	Research	Liquid	Solvents	0.038	D022	P-32, S-35	A	6
Academic >20,000 students - Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Research	Liquid	Trichloromethane, Phenol	0.051	D022			

Table A-7. F001 and F002 waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radio-nuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Research & Development	Ion Exchange Resins -- Solidified	Waste from research	Aqueous	Org-Cl	2.814	F001	H-3, C-14	A	25,000.000
Government -- Federal (Military) -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Maintenance and repair of U.S. Navy ships	Aqueous	1,1,1-trichloroethane	0.258	F002	Co-60	A	0
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from research	Aqueous	Trichloroethylene	0.042	F002			
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.) -- Toxic	Degreasing, cleaning operations	Aqueous	Spent Solvents F001	6.332				
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generator (100-1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil	freon laundering garment waste	Bulk	Trichloro-ethylene, freon	0.145	F002	Fe-55, Cs-137	A	0.000
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Organic (Freon)	Dry Cleaning Solvent/sludge	Bulk Liquid	Freon	0.872		Co-60, Cs-137		1.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generator (100-1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Abandoned Decommissioned Laundry Unit	Bulk liquid	1,1,2-Trichloro-1,1,2-Trifuoroethane	0.334	F002	Ag-110, Co-60, Cs-134, Cs-137, Mn-54, Sb-122		0.250
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Clean / decontamination of equipment and protective clothing	Bulk liquid	Chloroflouro-carbons	1.104	F001			
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Component degreasing, routine maintenance, area clean-up	Bulk liquid	Halogenated solvents	0.436	F001			
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Decontamination pressure washer	Bulk liquid	Halogenated degreasing solvents	0.102	F001			

Table A-7. F001 and F002 waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radio-nuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Pressurized Water Reactor	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Degreasing Solvents	Bulk liquid	Freon, solvents	1.671	F001	Co-60, Cs-137		0.000
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Evaporator bottoms from dry cleaning and decon. machines and Freon in machine filters	Bulk liquid	1, 1, 2-trichloro-1, 2, 2-trifluoroethane and Freon-113	0.482	F002			
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Maintenance activities	Bulk liquid	Trichloro-trifluoroethane distillation bottoms	1.090	F002	Co-60, Fe-55, Cs 134, Cs-137	A	0.001
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generator (100-1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.) -- Freon	Tool decon unit / dry cleaning facility	Bulk liquid	Freon	0.087	F001			
Industrial -- Decontamination facility & waste reduction	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)		Bulk Liquid	Mixture	4.798	F001	H-3	A	1.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.) -- Flammable	Paint solvent waste	Bulk Liquid	Freon	1.069	F001	Co-60, Cs-134, Cs-137		0.001
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.) -- Flammable	Paint/Solvent waste	Bulk Liquid	Chlorinated Solvents	0.154	F001	Co-60, Cs-137, Mn-54		0.001
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Other - (Specify) -- Liquid Freon	Dry cleaning filters cartridges and sludges	Bulk liquid	Freon	5.521	F002			
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils	Dry cleaners, freon degreasing, cleaning solvent contaminated oils	Bulk liquid	Halogenated cleaning and degreasing wastes	3.705	F001	H-3, Co-60, Cs-134, Cs-137	A	163.200

Table A-7. F001 and F002 waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radio-nuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil	Generated from oil used in refrigeration units	Bulk Liquid	Freon	0.726	F001	Co-60, Cs-137		0.010
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generated (100-1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Cleaning agent	Bulk liquids	Trichlorotri-fluoroethane	0.145	F002			
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Degreasing	Bulk liquids	Solvents	1.220	F002	Co-60, Cs-137	A	0.000
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Used as a cleaning agent	Bulk liquids	Freon / solvents	1.220	F001	Co-60, Cs-137, Mn-54	A	0.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generated (100-1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.) -- Flammable	Cleaning agent	Bulk liquids	Organics	0.145	F001, F002			
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity reactor (>1000 kg/month)	Liquid organic -- (solvents, chlorinated solvents, etc.)	Cleaning Turbine Parts	Liquid	Freon	0.218	F001, F002, U075, U121		A	0.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Decontamination / cleaning tools and equipment	Liquid	Waste solvent	0.058	F001	Co-60, Cs-134, Cs-137		0.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Degreasing Activities	Liquid	Spent solvent	0.145	F001	Fe-55, Co-58, Co 60, Ni-63, Cs-134, Cs-137	A	0.000
Nuclear Reactor Facility -- Pressurized Water Reactor	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Dry Cleaning Units	Liquid	1, 1, 2-Trichloro-1, 2, 2-Trifluoroethane	0.036	F002	Co-60, Cs-137	A	0.020

Table A-7. F001 and F002 waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radio-nuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	degreasing/dry cleaning	Liquid	Halogenated solvents	0.436	F002	H-3, Fe-55, Ni-63, Co-60, Nb-95, Cs-137, Cs-134	A	0.000
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Tool Decon unit	Liquid	Freon still bottoms	0.029	F001			
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)		Liquid	SKL-NF-ZC-7B (spot check)	0.145	F002			
Industrial -- Decontamination facility & waste reduction -- No EPA Classification	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Cleaning of contaminated components	Liquid	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.528	F002			
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generator (100-1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Distillation Bottoms	Liquid	Freon	0.436	F002	Co-60, Mn-54, Cs-134, Cs-137	A	0.200
Industrial -- Research & Development	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Laboratory experiments	Liquid	Halogenated Solvents	0.186	F001			
Industrial -- Nuclear fuel cycle other than power reactors -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Maintenance Degreasing	Liquid	Waste CFC-11	0.141			A	1
Academic >20,000 students	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Research	Liquid	Hexachlorobenzene	0.084	F002	C-14	A	0
Industrial	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)		Liquid	Methylene Chloride	1.368	F001			
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Other (Specify) -- TCA/TCE waste - Reactive	Research and development distillation process	Liquid	TCA/TCE	0.183	F002	U-235, U-238	A	0.055
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1000 kg/month)	Paint (& Thinner)	Used as a cleaning agent	Liquid	Paint / thinner	0.174	F001	Co-60, Cs-137, Mn-54	A	0.000

Table A-7. F001 and F002 waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radio-nuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Solidified Evaporator Bottoms/Concentrates/ Sump Sludge	Evaporation of liquid miscellaneous radwaste	Liquid	Saf-T - still bottoms - D039	0.040	F002			
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Solidified Evaporator Bottoms/Concentrates/ Sump sludge	Tool decontamination	Liquid	Freon TF - still bottoms	0.012	F002	Cs-137	A	0.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil	Pump oil	Liquid	Halogenated solvents	1.308	F001	H-3, Fe-55, Ni-63, Co-60, Nb-95, Cs-137, Cs-134	A	0.000
Nuclear Reactor Facility -- Pressurized Water Reactor	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil	Solvent contaminated waste oil	Liquid	Freon 112	7.264	F002	Cs-134, Cs-137, Co-58, Co-60	A	2.500
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Filters, Mechanical	HEPA filters from reactor and radwaste bldgs. HVAC; filters from dry cleaning and decon. machines	Liquid solid	1, 1, 2-trichloro-1, 2, 2-trifluoroethane and Freon-113	0.363	F002			
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Still bottoms from recovery	Semi-liquid sludge	Halogenated solvents	0.872	F002			
Industrial -- Research & Development	Filters, Mechanical	Filters from Freon decon machine	Solid	Still Bottoms	7.096	F002	Co-60, Mn-54, Fe-55	A	62.400
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Filters, Mechanical	Filtration of process liquids and liquid effluents	Solid	Trichlorotri-fluoroethane on cartridge filters	0.654	F002			
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Filters, Mechanical	RCS and Freon mechanical purification	Solid	Freon	0.291	F002	Co-60, Cs-134, Cs-137		0.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Other (Specify) -- Solid Freon Filters	Tool decontamination	Solid	Freon filters	0.145	F002			

Table A-7. F001 and F002 waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radio-nuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1,000 kg/month)	Other - (Specify)	Dry cleaning filters/sludge	Unc. Solid & Bulk Liquid	Freon	0.854	F002	Co-60, Cs-134, Cs-137		0.001
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Filters, Mechanical	routine operations occurring as a result of operating a nuclear power plant; mechanical filter changeout, ion exchange resin exchange filter backflushing. in plant Sys.. discharges, etc.	Uncomp. solid	1, 1, 2-trichloro-1, 1, 2-trifluoroethane	0.073	F002			
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- (Specify) -- Dry Cleaning Filter Cartridges and Sludge		Uncomp. solid / bulk lq.	Freon	33.706	F002	C0-60, Mn-54		55.020
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Filter Media -- Dewatered	Filter changeout on dry cleaners. Processing and clean-up of primary, secondary water, laundry operation, used oil processing	Uncompact, solid	Dry cleaner filters, laundry processing	1.090	F002	Co-60, Cs-137, Cs-134		0.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Filters, Mechanical	Filters from recovery	Uncompacted solid	Halogenated solvents	1.090	F002			
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generated (100-1000 kg/month)	Filters, Mechanical	Freon dry cleaning	Uncompacted solid	Trichlorotri-fluoroethane	2.615	F002			
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- (Specify)	Dry cleaning filters	Uncompacted solid	Freon	1.743	F002	Co-60, Cs-137		1.000
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1000 kg/month)	Filters, Mechanical	Mechanical filtration of liquid effluent and decontamination equipment	Uncompacted solids	Freon filters	1.860	F001	Co-60, Cs-137, Mn-54	A	0.000

Table A-8. F003 waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radio-nuclides	NRC Class	Cumul-ative Activity (mCi)
Industrial -- Research & Development	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Laboratory research	Absorbed Liquid	Ethyl Acetate	0.186	F003	C-14	A	40.000
Industrial -- Research & Development	Other biological waste (Non-infectious)	Laboratory research - cell labeling. From cleanup procedure	Absorbed Liquid	Ethyl Acetate	0.093	F003	C-14	A	30.000
Industrial -- Research & Development	Trash and/or Solid Waste (not lead) -- non-compacted	Laboratory research. From cleanup procedure	Absorbed Liquid	Ethyl Acetate	0.093	F003	C-14	A	30.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity reactor (>1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Cleaning Incore Instrumentation	Aqueous	Acetone	0.058	F003	Co-60, Co-58, Mn-54	A	1,982.000
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from research	Aqueous	Benzene	0.021	F003			
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from research	Aqueous	Xylene	0.021	F003			
Government -- Federal (hospital)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Chemical separation. Medical research	Bulk	Mixtures	0.446	F003	P-32	A	1.000
Academic (<10,000 students) -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	HPLC	Bulk liquid	Acetonitrile, methanol	0.436	D001,F003	H-3, C-14	A	0.24
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Laboratory generated. Analysis - Related waste.	Bulk Liquid	Xylene	3.360	F003	C-14	A	5.275
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Research	Bulk liquid	Liquid organic	0.316	F003	H-3, C-14	A	1

Table A-8. F003 waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radio-nuclides	NRC Class	Cumul-ative Activity (mCi)
Industrial -- Research and Development	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Research and development tracer studies, labeling studies, metabolism studies, in vitro and synthesis	Bulk liquid	Methanol	1.759	F003	C-14	A	2.5
Academic >20,000 students -- Large quantity generator (>1000 Kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Research laboratories	Bulk liquid	Acetone	0.011	F003	P-32, I-125, S-35	A	0.3
Academic >20,000 students -- Large quantity generator (>1000 Kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Research laboratories	Bulk liquid	Methanol	0.011	F003	H-3, C-14	A	0.1
Industrial -- Research and Development -- Small quantity generator (100-1,000 Kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from histology research	Bulk Liquid	Xylene	0.018	F003	H-3	A	1.400
Government -- Federal (Research & Development) -- Large quantity generator (>1000 Kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from medical research	Bulk liquid	Xylene	5.463	F003	H-3, C-14, P-32, I-125	A	4.5
Academic >20,000 students	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)		Bulk liquid	Ether	0.029	F003	C-14	A	0
Academic >20,000 students	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)		Bulk liquid	Methanol	0.029	F003	C-14	A	1.25
Industrial -- Decontamination facility & waste reduction	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)		Bulk Liquid	Xylene	0.696	F003		A	0.000
Government -- Federal (Research & Development) -- Conditionally exempt small quantity generator (<100 Kg/month)	Other - (Specify)	Analytical grade methanol	Bulk liquid	Methanol	0.042	F003	H-3, C-14	A	0.57
Medical (Non-Federal) -- Research -- Conditionally exempt small quantity generator (<100 Kg/month)	Other Biological waste (Non-infectious)	Culture media used during cell labelling procedures. Pure methanol used in drying.	Bulk Liquid	Methanol	0.186	F003	H-3	A	0.560

Table A-9. F005 waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	By product of plant maintenance	Solid	Isopropanol, acetone, methyl ethyl ketone	0.436	D001, F003, F005	Mn-54, Co-60, Fe-59	A	3.880
Industrial -- Research & Development -- Conditionally exempt small quantity generator (<100 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Research cleanup	Solid	Toluene, Xylene	0.528	F005, F003	H-3, C-14	A	0.000
Academic <10,000 Students - Small quantity generator (100-1000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Emptied scintillation vials	Uncompacted solid	Toluene	0.071	F005	P-32	A	0
Government -- Federal (Research & Development) -- Conditionally exempt small quantity generator (<100 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted -- Flammable	LSC fluid cleanup	Uncompacted solid	Xylene, toluene	0.104	F003, F005	H-3, C-14	A	0.001
Industrial -- Research & Development (not-for-profit research & development lab) -- Large quantity generator (>1,000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Decontamination of facility and equipment	Uncompacted Solid	F-Listed Solvents	4.189	F001-5	C-14, H-3		0.000

Table A-10. P and U listed waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radio-nuclides	NRC Class	Cumul-ative Activity (mCi)
Academic 10,000-20,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	H3	Absorbed	[illegible]	0.145	U126	H-3	A	5.65
Industrial -- Manufacturing (50 200 employees on site) -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Aqueous -- Absorbed	Manufacture of in-vitro diagnostic kits. Plastic, paper, glass.	Absorbed Aqueous Liq.	Sodium Azide	7.680	P105			
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Radioisotopic biochemical assays	Absorbed liquid	Benzo(A)pyrene	0.069	U022	H-3		0.351
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from research	Aqueous	Phenol	0.021	U188			
Industrial -- Research & Development	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from research and manufacturing. HPLC Effluent	Bulk Liquid	Acetonitrile	0.946	U003	I-125	A	10.000
Government -- Federal (Research & Development) -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from research	Bulk liquid	Chloroform	0.034	U022	C-14		0.9
Government -- Federal (Research & Development) -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from research	Bulk liquid	Methanol	0.034	U154			
Industrial -- Research and Development -- Small quantity generator (100-1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from research	Bulk Liquid	Tetrahydrofuran	0.035	U213	H-3	A	2.000
Industrial -- Manufacturing (>200 employees on site) -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.) -- Toxic	Product Separation	Bulk liquid	Acetonitrile, methanol	0.264	U003, U154		A	75

Table A-10. P and U listed waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radio-nuclides	NRC Class	Cumul-ative Activity (mCi)
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Aqueous -- Absorbed	Research	Liquid	Formaldehyde	0.038	U122	H-3, C-14	A	0.5
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Aqueous -- Absorbed	Research	Liquid	Methanol	0.038	U154	H-3	A	0.5
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Aqueous -- Absorbed	Research	Liquid	Phenol	0.038	U188	H-3, C-14	A	2
Government -- Federal (Research & Development) -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Laboratory research practices. Liquid chromatography and LSC	Liquid	Methyl alcohol	0.026	U154	H-3, C-14	A	0.01
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from research	Liquid	Methylene Chloride, Chloroform (U044)	2.513	U044, U045			
Medical (non-Federal) -- Research -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Biomedical research	Liquid	Phenol	0.000	U188			
Academic 10,000-20,000 Students Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.) - Flammable	Research Procedure	Liquid	Chloroform	0.002	U044			
Academic 10,000-20,000 Students Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.) - Flammable	Research Procedure	Liquid	Methanol	0.001	U154	H-3	A	0.8
Academic 10,000-20,000 Students Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.) - Flammable	Waste from research	Liquid	Phenol	0.005	U188	P-32	A	1
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1000 kg/month)	Other -- (Specify) -- Liquid Iridite 14-2 (Chromic Acid Mixture)	Chromic acid mixture	Liquid	Iridite 14-2	0.058	U032			

Table A-10. P and U listed waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radio-nuclides	NRC Class	Cumul-ative Activity (mCi)
Academic 10,000-20,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Biological Waste (Non-infectious)	H3	Liquid vials	Triglycerol	0.153	U126	S-35	A	0.002
Academic <10,000 Students - No EPA Classification	Ion Exchange Resins -- Dewatered	Containing C-14 Label	Solid	Benz (A) Anthracene	0.036	U018	C-14		0.001
Academic <10,000 Students - No EPA Classification	Ion Exchange Resins -- Dewatered	Containing C-14 Label	Solid	Benzo (A) Pyrene	0.036	U022			
Academic <10,000 Students - No EPA Classification	Other - (specify) - Beryllium	Sealed sources	Solid	Beryllium	0.484	P015	Pu-239	A	6000
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Cell based and tube based assay waste (medical)	Solid	Acrylamide	0.093	U007			
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Lab research waste	Uncompacted solid	Dieldrin	0.004	P037	C-14	A	0.001
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Cell based and tube based assay waste (medical)	Solid	Sodium Azide	0.931	P105	S-35, I-125	A	0.200
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- (Specify) -- Hydrazine Waste	Off-spec. hydrazine and spill clean-up materials	Solid / liquid	Hydrazine liquid	0.145	U133	Co-60, Cs-134, Cs-137		0.000
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Absorbing paper and disposal glassware generated in radioisotopes biochemical assays and Ni63 wipe test	Trash/solid waste	Benzo(A)pyrene	0.172	U022	H-3		1.877
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Contaminated lab trash (gloves, pipet tips, bench paper, etc.) produced during DNA labelling experiments. Biochemistry protein assays.	Uncompacted Solid	Toluene, Granite Salts	2.095	F005, P030	C-14	A	0.415

Table A-11. Oil waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Solvent containing waste oil	Waste from research and service contract	Liquid	Vacuum Pump Oil	0.046		H-3, S-35	A	0.346
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil	Generated from cleaning oily valves with Varsol solvent	Bulk liquid	Mineral spirits	0.872	D001	Co-60, Cs-137		0.001
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil	Miscellaneous maintenance activities	Bulk liquid	Solvents in oil	0.436		Co-60, Fe-55, Cs-134, Cs-137, Mn-54	A	0.010
Industrial -- Manufacturing (<50 employees on site) -- Large quantity generator (>1,000 kg/month)	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil	Vacuum pumps	Bulk Liquid	Waste Oil	0.473				
Government -- Federal (Research & Development) -- Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example)	Biomedical research	Liquid	Waste oils	0.127	D001	H-3, C-14	A	5
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Waste oil free from solvent contamination	Maintenance of pumps, motors, etc.	Liquid	Used oil	11.623	D001	Co-60, Cs-134, Cs-137		0.000
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil	Used pump oils	Liquid	Benzene	0.141	D018	U-235, U-238	A	0.001
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil	Plant maintenance	Bulk liquid	Solvent contam. oil	0.436	F001	Co-60, Co-58, Fe-55	A	0.340

Table A-10. P and U listed waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radio-nuclides	NRC Class	Cumul-ative Activity (mCi)
Academic 10,000-20,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Biological Waste (Non-infectious)	H3	Liquid vials	Triglycerol	0.153	U126	S-35	A	0.002
Academic <10,000 Students - No EPA Classification	Ion Exchange Resins -- Dewatered	Containing C-14 Label	Solid	Benz (A) Anthracene	0.036	U018	C-14		0.001
Academic <10,000 Students - No EPA Classification	Ion Exchange Resins -- Dewatered	Containing C-14 Label	Solid	Benzo (A) Pyrene	0.036	U022			
Academic <10,000 Students - No EPA Classification	Other - (specify) - Beryllium	Sealed sources	Solid	Beryllium	0.484	P015	Pu-239	A	6000
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Cell based and tube based assay waste (medical)	Solid	Acrylamide	0.093	U007			
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Lab research waste	Uncompacted solid	Dieldrin	0.004	P037	C-14	A	0.001
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Cell based and tube based assay waste (medical)	Solid	Sodium Azide	0.931	P105	S-35, I-125	A	0.200
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- (Specify) -- Hydrazine Waste	Off-spec. hydrazine and spill clean-up materials	Solid / liquid	Hydrazine liquid	0.145	U133	Co-60, Cs-134, Cs-137		0.000
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Absorbing paper and disposal glassware generated in radioisotopes biochemical assays and Ni63 wipe test	Trash/solid waste	Benzo(A)pyrene	0.172	U022	H-3		1.877
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Contaminated lab trash (gloves, pipet tips, bench paper, etc.) produced during DNA labelling experiments. Biochemistry protein assays.	Uncompacted Solid	Toluene, Granite Salts	2.095	F005, P030	C-14	A	0.415

Table A-11. Oil waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Solvent containing waste oil	Waste from research and service contract	Liquid	Vacuum Pump Oil	0.046			A	0.346
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil	Generated from cleaning oily valves with Varsol solvent	Bulk liquid	Mineral spirits	0.872	D001	Co-60, Cs-137		0.001
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil	Miscellaneous maintenance activities	Bulk liquid	Solvents in oil	0.436		Co-60, Fe-55, Cs-134, Cs-137, Mn-54	A	0.010
Industrial -- Manufacturing (<50 employees on site) -- Large quantity generator (>1,000 kg/month)	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil	Vacuum pumps			0.473				
Government -- Federal (Research & Development) -- Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example)	Biomedical research	Liquid	Waste oils	0.127	D001	H-3, C-14	A	5
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Waste oil free from solvent contamination	Maintenance of pumps, motors, etc.	Liquid	Used oil	11.623	D001	Co-60, Cs-134, Cs-137		0.000
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil	Used pump oils	Liquid	Benzene	0.141	D018	U-235, U-238	A	0.001
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil	Plant maintenance	Bulk liquid	Solvent contam. oil	0.436	F001	Co-60, Co-58, Fe-55	A	0.340

Table A-11. Oil waste generated in 199

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil	Solvent contaminated lubricating oil	Bulk liquid	Chloroflouro-carbons	0.058	F001			
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil	Degreasing	Bulk liquids	Solvents	1.220	F001	Co-60, Cs-137	A	0.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generator (100-1,000 kg/month)	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil	Miscellaneous pumps	Liquid	Oil with Halogenated Solvents	2.943	F001	Cs-137, Co-60, Cs-134, Sb-125, Mn-54, Ag-110M, Ce-141	A	1.039
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils (2)	Equipment oil changes	Liquid (oil)	Waste oil, halogenated solvents	0.726	F001			
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1,000 kg/month)	Waste Oils (Seal oils from pumps for example) -- Solvent-contaminated waste oil	Decontamination solutions	Bulk Liquids	Spent Solvents	2.615	F001, F002, F003, F004, F005	H-3, C-14, Co-60, Cs 134, Cs-137	A	0.000
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils	Painting Operations	Liquid	1,1,1-Trichloroethane, acetone	1.090	F001, F003	Zn-65, Co-60, Mn-54	A	0.100
Nuclear Reactor Facility -- Pressurized Water Reactor	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil	Oil tests	Oil	Toluene	0.029	U220			
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Vitrified Ash or Resins	Maintenance	Absorbed liquid	Waste oil	1.308		Co-60, Cs-137, Cs-134, Zn-65	A	0.000
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Waste Oils (Seal Oils from pumps for example): Waste oil free from solvent contamination	Manufacture of electron tubes	Absorbed Liquid	Vacuum Pump Oil	0.465		H-3	A	0.000

Table A-11. Oil waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Manufacturing >200 employees on site -- Large quantity generator (>1,000 kg/month)	Waste Oils (Seal Oils from pumps for example): Waste oil free from solvent contamination	Residual oil from nuclear components. Lubricants of contaminated component	Aqueous	Oil	0.791			A	30.000
Academic <10,000 Students	Waste oil free from solvent contamination	Oil from circulation and vacuum pumps, research and reactor operation	Bulk liquid	Waste oil	0.004	D001	Co-60, Mn-54	A	0.001
Academic >20,000 students - Large quantity generator (>1000 kg/month)	Waste oil free from solvent contamination	Pump oil	Bulk liquid	Waste oil	0.084		Zn-65	A	0.1
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Waste oil free from solvent contamination	Various pump casting oil changeout and misc. oil leakage accumulation in condensate pit sump.	Bulk liquid	Waste oil	1.090		Co-60, Cs-137, Cs-134	A	0.349
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Waste oil free from solvent contamination	Equipment oil change (e.g.: reactor coolant pumps)	Bulk liquid	Waste oil	4.577	D001	Cs-137, Cs-134	A	0.002
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Waste oil free from solvent contamination	Mechanical / equipment lubricating oil	Bulk liquid	Waste oil	0.145				
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Waste oil free from solvent contamination	Oil accumulated from pump leakage	Bulk liquid	Motor oil	0.776				
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Waste oil free from solvent contamination	Pump and turbine waste oils	Bulk liquid	Waste oil - Calif. listed	69.156		Cs-137, Cs-134, C0-60	A	1.600
Academic >20,000 students - Large quantity generator (>1000 kg/month)	Waste oils - free from solvent contamination	Waste pump oil	Bulk liquid	Waste oil	0.316	D001	H-3	A	2

Table A-11. Oil waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Manufacturing (50 200 employees on site) -- Large quantity generator (>1,000 kg/month)	Waste Oils free from solvent contamination	Vacuum pump oil. Mechanical pumps pumping tritium contaminated systems	*Bulk Liquid*	Vacuum Pump Oil	0.028		H-3	A	0.006
Industrial -- Research and Development -- Large quantity generator(>1,000 kg/month)	Waste oil free from solvent contamination. Vacuum pump oil.	Pharmaceutical research. Vacuum pump oil.	Gallons	Waste Oil	0.018		H-3, C-14	A	0.000
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oil	Maintenance	Liquid	Waste oil	21.793		Co-60, Cs-137	A	0.000
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example)	Equipment lubrication and maintenance	Liquid	Non-hazardous	8.717		Mn-54, Co-60, Fe-59	A	5.000
Academic >20,000 students - Large quantity generator (>1000 kg/month)	Waste Oils (Seal Oils from pumps for example)	Pumps	Liquid	waste oils	0.034		S-35	A	0
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generator (100-1000 kg/month)	Waste Oils (Seal Oils from pumps for example)	Reactor coolant pumps lubricating oil	Liquid	Oil	0.218		Co-60, Cs-137	A	0.002
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1,000 kg/month)	Waste Oils (Seal Oils from pumps for example) -- Waste Oil free from solvent contamination	Lubricant	Liquid	Waste Oil	1.090		Co-60, Cs-137, Fe-55, Zn-65	A	0.000
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil	Plant Maintenance	Liquid	Waste oil / solvent	0.218				
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1,000 kg/month)	Waste Oils (Seal Oils from pumps for example): Waste oil free from solvent contamination	Lubricating oil - 137.3 FT3 burned as alternate fuel	Liquid	Waste Oils	3.990		Co-60, Cs-137	A	0.006

Table A-11. Oil waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generator (100-1,000 kg/month)	Waste Oils (Seal Oils from pumps for example): Waste oil free from solvent contamination	Seal oils and pump lubricant replacement	Liquid	Oil	1.308		Co-60, Mn-54	A	0.130
Industrial -- Nuclear fuel cycle other than power reactors -- Large quantity generator (>1000 kg/month)	Waste Oils -- Waste oils free from solvent contamination	Plant maintenance of equipment and vehicles	Liquid	Waste oil	4.678			A	2
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Vitrified Ash or Resins	Maintenance	Bulk liquid	Waste oil	0.654		Co-60, Cs-137, Cs-134, Zn-65	A	0.000
Industrial	Other (Oil)				1.368				
Industrial	Waste Oil			Oil	3.518				

Table A-12. Other organic waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generated (100-1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.) -- Flammable		Bulk liquid	Paraffin - naphthenes	0.029				
Industrial -- Research and Development -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from R & D labs	Bulk liquid	Acetone, hexane, methylene chloride, methanol, acetonitrile, chloroform, ethyl acetate	1.407		C-14	A	150
ıdustrial -- Manufacturing (<50 employees on site) -- Large quantity generator (>1,000 kg/month)	Other -- (Specify)	Manufacture of radiolabeled compounds	Bulk Liquid	Hazardous Waste Liquid	3.312				
Government -- Federal	Liquids Organic - (Solvents, chlorinated Solvents, etc.) -- Flammable	Chemical laboratory	Liquid	Liquid, organic	0.240				
Academic >20,000 students - Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Research	Liquid		0.023		Cd-109	A	0
Medical (non-Federal) -- Research -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Biomedical research	Liquid	Chloroform	0.008	F024	C-14	A	0.01
Industrial -- Nuclear fuel cycle other than power reactors -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Laboratory Testing	Liquid	Lab solvent	0.211				
Academic <10,000 Students - No EPA Classification	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Research	Liquid	Mirex	0.084		C-14	A	0.05
Industrial -- Nuclear fuel cycle other than power reactors -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Maintenance painting	Liquid	Waste xylene	0.559				

Table A-12. Other organic waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Nuclear fuel cycle other than power reactors -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Laboratory testing	Liquid	Waste acetone	0.070				
Medical (non-Federal) -- Research -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Basic biomedical research and education. LSC and HPLC wastes.	Organic liquids-bulk	Flammable liquids	0.038		H-3, C-14	A	1
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- (Specify) -- Waste Adhesive	Facility maintenance activities, excess / out of spec..	Solid / liquid	Ignitable liquid	0.029		Co-60, Cs-134, Cs-137		0.000
Medical -- Medical College/Hospital	Organic Solvents			Solvents	0.287				
Industrial	Other (Specify) -- Trichloroethene			Trichloroethene	0.014				
Industrial -- Commercial Radiopharmacy	Organic -- Acetonitrile			Acetonitrile	0.102				
Industrial -- Commercial Radiopharmacy	Organic -- Methanol			Methanol	0.102				
Government -- Federal (Military)	Other (Specify) -- Organic			ORG	24.451				

Table A-12. Other organic waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generated (100-1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.) -- Flammable		Bulk liquid	Paraffin - naphthenes	0.029				
Industrial -- Research and Development -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from R & D labs	Bulk liquid	Acetone, hexane, methylene chloride, methanol, acetonitrile, chloroform, ethyl acetate	1.407		C-14	A	150
Industrial -- Manufacturing (<50 employees on site) -- Large quantity generator (>1,000 kg/month)	Other -- (Specify)	Manufacture of radiolabeled compounds	Bulk Liquid	Hazardous Waste Liquid	3.312				
Government -- Federal	Liquids Organic - (Solvents, chlorinated Solvents, etc.) -- Flammable	Chemical laboratory	Liquid	Liquid, organic	0.240				
Academic >20,000 students - Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Research	Liquid		0.023		Cd-109	A	0
Medical (non-Federal) -- Research -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Biomedical research	Liquid	Chloroform	0.008	F024	C-14	A	0.01
Industrial -- Nuclear fuel cycle other than power reactors -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Laboratory Testing	Liquid	Lab solvent	0.211				
Academic <10,000 Students - No EPA Classification	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Research	Liquid	Mirex	0.084		C-14	A	0.05
Industrial -- Nuclear fuel cycle other than power reactors -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Maintenance painting	Liquid	Waste xylene	0.559				

Table A-12. Other organic waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Nuclear fuel cycle other than power reactors -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Laboratory testing	Liquid	Waste acetone	0.070				
Medical (non-Federal) -- Research -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Basic biomedical research and education. LSC and HPLC wastes.	Organic liquids-bulk	Flammable liquids	0.038		H-3, C-14	A	1
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- (Specify) -- Waste Adhesive	Facility maintenance activities, excess / out of spec..	Solid / liquid	Ignitable liquid	0.029		Co-60, Cs-134, Cs-137		0.000
Medical -- Medical College/Hospital	Organic Solvents			Solvents	0.287				
Industrial	Other (Specify) -- Trichloroethene			Trichloroethene	0.014				
Industrial -- Commercial Radiopharmacy	Organic -- Acetonitrile			Acetonitrile	0.102				
Industrial -- Commercial Radiopharmacy	Organic -- Methanol			Methanol	0.102				
Government -- Federal (Military)	Other (Specify) -- Organic			ORG	24.451				

Table A-13. LSC waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Contains H-3 and C-14		H3 and C14	11.879		H-3, C-14		36.19
Industrial -- Manufacturing (<50 employees on site)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Liquid scintillation		Scintillation Vials	0.349		H-3	A	0.000
Government -- Federal (Hospital)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)			LSC with 14C, 3H	0.018				
Industrial	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)			14C	31.025				
Academic	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Contains H-3, S-35, Ca-45, P-32, I-125, Na-22, I-131, Co-57		H3,S35,Ca45,P32,I125,Na22,I131,Co57	8.667		P-32, S-35, I-125, Na-22, Ca-45, Co-57, I-131		267.28
Medical (non-federal) -- Medical college/hospital	Other (Specify) -- LSC			LSC	0.042				
Medical (non-federal) -- Medical college/hospital	Other (Specify) -- LSC			LSC	0.042				
Industrial -- Research & Development -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Aqueous -- Absorbed	Aqueous waste disposal method	Absorbed Liquid	Counting Fluid	0.141		C-14	A	9.100
Industrial (not for profit toxicological research institute) -- Conditionally exempt small quantity generator (< 100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Absorbed liquid	Hydrocarbon Solvent	0.352	D001	H-3, C-14		83.100
Industrial -- Research & Development	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory research - counting procedures	Absorbed Liquid		0.372	F003, F005	C-14	A	50.000
Industrial -- Research and Development -- Small quantity	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Biotechnology R&D, 14C and 3H	Absorbed liquid	Xylene	0.528	F003	C-14 , H-3	A	5.7
Government -- Federal (Research & Development) -- No EPA	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Absorbed liquid	Xylene, toluene	2.318	F003, F005	H-3, C-14	A	1.059
Academic >20,000 students	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Lab counting procedures	Absorbed liquid	Toluene	0.316	F005	H-3, C-14, I-125	A	1

Table A-13. LSC waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Waste from research	Absorbed Liquid	Biocount Scintillation Cocktail	1.489	D001	H-3	A	0.456
Academic <10,000 Students	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Absorbed liquid	1,2,4-trimethybenzene	0.084	F005	C-14	A	0.1
Industrial -- Research & Development -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	H-3 or C-14 - small volume lab experiments for counting	Absorbed Liquid	Toluene	0.372	F005	H-3	A	0.055
Medical (Non-Federal) -- Laboratory	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	In-vitro diagnostic testing	Absorbed Liquid	Xylene, Toluene	26.223	F003, F005	H-3	A	0.000
Academic >20,000 students	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Absorbed liquid	Toluene	1.147	F005	H-3	A	0
Industrial -- Research and Development -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Biotechnology R&D, 125I, 32P, 35S, 51Cr	Absorbed liquid	Xylene	0.528	F003	Major nuclides are the following: U-235, U-239, P-32, Zn-65, Ni-59, Bi-207, Ni-63, Mn-54, Sr-90, Fe-59, Cs-137, Ba-133, Cs-134, Ca-45, Co-60, Rb-86, S-35, C0-47, I-125, Co-57, Cr-51, Pm-147, Na-22, Tc-99, C-136	A	1
Academic >20,000 students	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Lab counting procedures	Absorbed liquid	Toluene	0.631	F005	H-3, C-14, I-125	A	1
Academic <10,000 Students	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Laboratory counting procedures	Absorbed liquid	1,2,4-Trimethybenzene	0.084	F005	H3	A	0.001
Academic >20,000 students	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Laboratory counting procedures	Absorbed liquid	Toluene	0.956	F005	C-14, P-32, S-35	A	0
Industrial -- Research & Development -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Other isotopes small volume lab experiments for counting	Absorbed Liquid	Toluene	0.745	F005	P-32, S-35	A	0.100

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Government -- State	Liquids Scintillation, containing C-14 and/or H-3 -- (fluids or vials) - Flammable	Scintillation cocktail	Aqueous	Toluene, xylene	0.067	F005, F003			
Medical (non-federal) Medical college/hospital -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting practices	Aqueous	Toluene, xylene	12.690	F005, F003	H-3, C-14	A	54.014
Industrial -- Decontamination facility & waste reduction -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Aqueous	Emulsifier and Fluors	1.120	F003	H-3	A	14.340
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Sample counting	Aqueous	Xylene, Toluene	2.486	F003, F005	H-3	A	12.050
Government -- Federal (Research & Development) -- No EPA Classification	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Radioanalysis waste	Aqueous	Scintillation fluids	2.061	U220	C-14, H-3, I-125, P 32, Rb-86, S-35, Co-47, Cr-51, Na-24	A	7.237
Industrial -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Lab counting procedures, waste from research	Aqueous	Non-halogenated solvents	0.035	F003	H-3, C-14	A	5
Industrial -- Research & Development	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Tissue solubilizes. Laboratory counting	Aqueous	Toluene	0.698	F005	H-3, C-14	A	1.200
Medical (Non-Federal) -- Hospital 250-750 beds -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research	Aqueous	Toluene	7.372	F005	H-3, C-14	A	0.900
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Scintillation fluids and gel wastes	Aqueous	Toluene, Xylene	1.396	F005, F003	C-14, H-3	A	0.120
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Lab counting procedures. Scintillation fluids.	Aqueous	Xylene	2.141	F003	C-14	A	0.010

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Research & Development -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Waste from research	Aqueous	Xylene	0.264	F003	H-3, C-14, P-32, S-35	A	0.000
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Biological experimentation	Aqueous	Toluene, xylene	0.021	F005,F003	H-3, C-14	A	0
Medical (Non-Federal) -- Research -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Human white cells are labeled with H-3 Thymidine	Aqueous	Toluene	0.116	F005	H-3	A	0.000
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials) -- Flammable	Laboratory counting procedures	Aqueous	Ignitability	60.083	D001	H-3, C-14	A	3.000
Medical (non-federal) Medical college/hospital -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Laboratory counting practices	Aqueous	Toluene, xylene	27.634	F005, F003	H-3, C-14, S-35, I-125	A	117.763
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Waste from research (other)	Aqueous	Toluene	3.156	F005	H-3, C-14, P-32, S-35	A	18.4
Industrial -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Lab counting procedures, waste from research	Aqueous	Non-halogenated solvents	0.035	F003	Cd-104, Ag-110m	A	1
Industrial -- Decontamination facility & waste reduction -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Aqueous	Emulsifier and Fluors	1.120	F003	H-3	A	14.340
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Lab counting procedures	Aqueous	Xylene, Toluene	2.402	F003, F005	I-125	A	1.000

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Manufacturing (50-200 employees on site) -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Lab counting procedures from test kits	Aqueous	Sodium Azide	0.465	P105	I-125	A	0.500
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Scintillation	Aqueous	Toluene, Xylene	1.396	F005, F003	I-125, P-32, S-35	A	0.050
Industrial -- Research and Development -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Safety surveys / scintillation counting in R&D	Aqueous	Toluene	0.264	F005	P-32	A	0.019
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing **radioisotopes other than C-14 and/or** tritium -- (fluids or vials)	Lab counting procedures. **Scintillation fluids.**	Aqueous	Xylene	2.141	F003	H-3, S-35	A	0.010
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials) -- Flammable	Laboratory counting procedures	Aqueous	Ignitability	184.507	D001	I-125, P-32	A	9.000
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or H-3 (fluids or vials) -- Toxic	Laboratory counting procedures, waste from research	Bulk	Xylene	2.748	F003	H-3, C-14	A	70
Medical (Non-Federal -- Medical college/hospital	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Spent Non-Halogenated Solvents	Bulk	Toluene	1.820	F005	H-3, C-14	A	14.100
Government -- Federal (hospital)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	HPLC counting - Research	Bulk	Toluene	22.296	F005	**C-14, H-3**	A	10.000
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Bulk	Xylene	0.172	F003	H-3, C-14	A	0.5
Medical (Non-Federal -- Medical college/hospital	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Spent Non-Halogenated Solvents	Bulk		1.820	F005			
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and H-3 (fluids or vials) -- Toxic	Laboratory counting procedures, waste from research	Bulk	Xylene	24.729	F003	P-32, S-35, I-125, Cr-51	A	650

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Laboratory counting procedures	Bulk	Xylene	0.191	F003	P-32	A	2
Medical (Non-Federal -- Medical college/hospital	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Bulk	Toluene	1.730	F005	I-125, P-32, Cr-51, Na-22	A	17.000
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Scintillation, containing C-14 and/or tritium -- (fluids or vials)		Bulk liquid	1, 2, 4-trimethyl-benzene	0.029	D001			
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Scintillation, containing radioisotopes other than C-14 and / or tritium -- (fluids or vials)	Lab analysis	Bulk liquid	Toluene	0.087	F005	Co-60, Cs-137, H-3		0.000
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or H-3 -- (fluids or vials) - Flammable (Absorbed)	laboratory counting procedures	Bulk liquid	Toluene	1.249	F005	H-3, C-14	A	7
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Aquasol-2 scintillation cocktail	Bulk liquid	Xylene	0.084	F003	H-3, C-14	A	1500
Academic <10,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Activities from research laboratories	Bulk liquid	Ignitable	0.316	D001	H-3, C-14	A	70
Industrial -- Manufacturing (<50 employees on site) -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Bulk Liquid	Flammable Liquid	49.675	D001, F002, F003, F005	C-14	A	70.000
Academic <10,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Bulk liquid	Toluene	0.191	F005	C-14, H-3		60
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Lab counting procedures. Research	Bulk liquid	Xylene, toluene	7.186	F003, F005	H-3, C-14	A	60
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research	Bulk liquid	Toluene	1.683	F005	H-3, C-14	A	56
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Scintillation counting	Bulk liquid	Xylene	1.683	F003	H-3, C-14	A	56

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic 10,000-20,000 Students	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Liquid scintillation counting	Bulk liquid	Toluene	11.995	F005	H-3, C-14	A	25.25
Government: -- Federal (hospital) -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Liquid scintillation counting	Bulk Liquid	Toluene, Xylene	1.746	F003, F005	H-3, C-14	A	20.000
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Waste from research	Bulk liquid		0.551	F005, F003, F001	H-3, C-14	A	17.1
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Liquid scintillation counting	Bulk liquid	Toluene	3.156		H-3, C-14	A	15
Government -- Federal (Research & Development) -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Scintillation cocktail, solvent	Bulk liquid	Xylene	0.167	F003	H-3, C-14	A	11.8
Industrial -- Decontamination facility & waste reduction -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Metabolism studies; smear (wipe)test program	Bulk liquid	Flammable liquid	7.651	D001		A	10.842
Academic (<10,000 students)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Biological Research. Liquid Scintillation	Bulk liquid	Xylene, toluene	0.287		H-3, C14	A	10
Industrial -- Research and Development -- Conditionally exempt small quantity generator (>100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Lab. counting procedures	Bulk liquid	Toluene	0.352	F005		A	10
Academic >20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Bulk Liquid	Toluene	0.860	F005	H3, C14	A	10
Industrial -- Sealed Source/Gauge/Instrument User	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Spent reagents, LSC counting procedures	Bulk Liquid	Toluene, Xylene	4.189	F005, F003	C-14, H-3		9.000
Academic 10,000-20,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research/teaching	Bulk liquid	Xylene	0.094	F003	H-3, C-14	A	7
Academic <10,000 Students	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Waste from research activity	Bulk liquid	Toluene, xylene	1.911	F003, F005	H-3, C-14	A	6.75

Table A-13. LSC waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Waste from research laboratories	Bulk Liquid	Xylene, Methanol	18.851	F003	H-3, C-14	A	6.550
Industrial -- Research and Development	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research and development tracer studies, labeling studies,	Bulk liquid	Toluene, xylene	1.407	F005, F003	C-14, H-3	A	6
Government -- Federal (Research & Development) -- No EPA Classification	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Lab counting procedures, waste from research	Bulk liquid	Toluene	0.003	F005	H-3, C-14	A	5
Industrial -- Research & Development -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Biological research - LS counting of C-14 / H-3	Bulk Liquid	Toluene	2.793	F005	H-3, C-14	A	4.500
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Use cocktail, xylene/pseudocumene (trimethylbenzene) mixture	Bulk liquid	Xylene, pseudocumene	0.258	F003	H-3	A	2
Government -- Federal (Hospital) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research use	Bulk liquid	Toluene	1.030	U220	H-3	A	2
Academic >20,000 Students	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Counting procedures	Bulk liquid	Toluene, xylene	5.428	F003, F005	H-3, C-14	A	1.5
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Liquid scintillation counting fluid vials	Bulk liquid	Toluene	0.316	F005	H-3, C-14	A	1
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory procedures	Bulk liquid	Xylene, toluene	0.631	F003, F005	H-3, C-14	A	0.5
Medical (Non-Federal) -- Research	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures, spent reagents	Bulk Liquid	Xylene, Methylene Chloride, Toluene	0.365	F003, F005	H-3	A	0.400
Industrial -- Research & Development -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory research counting procedure	Bulk Liquid	Toluene	2.234	F005	H-3	A	0.150
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting - liquid scintillation media meeting,	Bulk liquid	Toluene	0.031	F005	H-3, C-14	A	0.1

Table A-13. LSC waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Medical (Non-Federal) -- Research -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Bulk Liquid	Trimethylbenzene	0.233	F003	H-3, Cr-51	A	0.063
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	14-C Research/Teaching - Wipe Tests	Bulk liquid	Toluene	0.001	F005	H-3, C-14		0.05
Industrial -- Research & Development -- Small quantity generator (<100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Toxicity testing in laboratory animals, lab counting procedures	Bulk Liquid	Toluene, Xylene	4.468	F005, F003	H-3	A	0.035
Industrial -- Research & Development -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Scintillation counting	Bulk Liquid	1,2,4-Trimethylbenzene, P-xylene, other solvents.	3.491	D001	H-3, C-14	A	0.022
Industrial -- Research and Development -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Lab Counting Procedures	Bulk liquid	Toluene	0.088	F005	C-14	A	0.01
Industrial -- Research & Development	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Bulk Liquid	Toluene	0.698	F005	H-3	A	0.010
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Bulk Liquid	Xylene	0.698	F003	H-3	A	0.007
Government -- Federal (Research & Development) -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Bulk liquid	Ultrafluor high sol 10 (naphtha)	0.025	D001	H-3	A	0.004
Government -- Federal (Research & Development) -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Spent is cocktail	Bulk liquid	Xylene, toluene	0.050	F003, F005	H-3	A	0.004
Government -- Federal (Research & Development) -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	14C/3H counting cocktails from research. Toluene cocktail	Bulk liquid	Ignitability	0.260	D001	C-14	A	0.003

Table A-13. LSC waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Counting procedure	Bulk liquid	LSV	50.294	F005, F003	H-3, C-14	A	0
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Lab counting procedures	Bulk Liquid	Ignitability	5.586	D001	H-3, C-14	A	0.000
Industrial -- Research and Development -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Bulk liquid	Toluene	0.025	F005	C-14		0
Medical (Non-Federal) -- Hospital <250 beds -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research laboratory counting procedures	Bulk Liquid	Toluene, Xylene	3.880	F005, F003	H-3, C-14	A	0.000
Academic <10,000 students -- No EPA Classification	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Teaching lab experiments.	Bulk liquid	Toluene	0.004	F005	H3	A	0
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Waste from research. Commercial liquid scintillation solution.	Bulk Liquid	Ignitable	0.093	D001	H-3, C-14	A	0.000
Academic <10,000 Students	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Lab experiments	Bulk liquid	Liquid scintillation	0.001				
Medical (Non-Federal) -- Research -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Bulk Liquid	Isopropanol	0.233	F005			
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Liquid scintillation media	Bulk Liquid	Xylene	0.008	F003			
Government -- Federal (Research & Development) -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research using liquid scintillation counters	Bulk liquid	Toluene, acetone	0.333	F003, F005			
Industrial -- Manufacturing (>200 employees on site)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Waste from research	Bulk Liquid	Xylene	1.769	F003	H-3, C-14	A	0.500

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic <10,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C14 and tritium - (fluids or vials) - Flammable	Laboratory counting procedures	Bulk liquid	Methanol, toluene, xylene, ethyl ether, 1, 1, 1-trichloroethane, carbon, tetrachloride	3.342	F003, F005, F002, F001	H-3, C-14	A	24.875
Academic >20,000 students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C14 and tritium - (fluids or vials) - Flammable	Academic research laboratory counting procedures	Bulk Liquid	Xylene	0.268	F003	H-3, C-14	A	3.5
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C14 and tritium - (fluids or vials) - Flammable	Laboratory counting procedures	Bulk liquid	Xylene, Toluene	0.726	F003, F005	H-3, C-14	A	0.839
Academic <10,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C14 and tritium - (fluids or vials) - Flammable	Laboratory counting procedures	Bulk liquid	Toluene, xylene	0.287	F005, F003	H-3, C-14	A	0.0224
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing isotopes other than C-14 and H-3 -- (fluid or vials)	Scintillation fluids	Bulk liquid	Waste flammable liquid N.O.S.	0.116	D001	Co-60, Co-58, Cs-137		0.001
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and H-3 -- (fluids or vials) -- Flammable	Laboratory counting procedures	Bulk liquid	Toluene	1.249	F005	I-125, Na-22, P-32, S-35, C-136	A	0.68
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Lab counting procedures	Bulk liquid	Xylene, toluene	5.733	F003, F005	H-3, C-14, S-35, Ca-45	A	30
Academic <10,000 Students	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Waste from research activity	Bulk liquid	Toluene, xylene	1.796	F003, F005	P-32, S-35, I-125	A	25.53
Industrial -- Research and Development -- Conditionally exempt small quantity generator (>100 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Lab counting procedures	Bulk liquid	Toluene	0.528	F005		A	20
Government -- Federal (Research & Development) -- No EPA Classification	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Lab counting procedures, waste from research	Bulk liquid	Toluene	0.017	F005	I-125	A	10

Table A-13. LSC waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Waste from research	Bulk liquid		0.707	F005, F003, F001	Others	A	8.3
Academic >20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Laboratory counting procedures	Bulk Liquid	Toluene	0.153	F005	S35, I125	A	7.5
Academic 10,000-20,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Research/ teaching	Bulk liquid	Xylene	0.094	F007	S-35	A	7
Medical (non-federal) Medical (non-federal) Medical college/hospital -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Research	Bulk liquid		1.720	F005	H-3, C-14, P-32, Sr 89, Sr-90	A	7
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Liquid scintillation counting	Bulk liquid	Toluene	1.263		C-136, Na-22	A	3
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	32-P - Monitoring - wipe tests	Bulk liquid	Toluene	0.000	F005	P-32		0.5
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Laboratory counting procedures	Bulk liquid	Xylene, toluene	0.631	F003, F005	H-3, C-14, Ca-45, I-125	A	0.5
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Liquid scintillation media	Bulk liquid	Toluene	0.092	F005	P-32, I-125, S-35	A	0.4
Academic 10,000 to 20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Scintillation vials from surveys	Bulk liquid	Waste, flammable	0.287	F005	H-3	A	0.2
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Research	Bulk liquid	Toluene	0.168	F005	P-32, S-35	A	0.113
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Scintillation counting	Bulk liquid	Xylene	0.168	F003	P-32, S-35	A	0.113

Table A-13. LSC waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic <10,000 Students -- No EPA Classification	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Laboratory research	Bulk liquid	Toluene	0.316	F005	S-35, I-125, Ca-45, Fe-59	A	0.0232
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Laboratory counting, liquid scintillation media meeting, EPA hazard standards was banned from use Nov. 1, 1990 this campus; stored for decay	Bulk liquid	Xylene	0.023	F003			
Industrial -- Research and Development -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials) -- contains P-32	Laboratory counting procedures	Bulk liquid	Toluene	0.001	F005	P-32		0
Industrial -- Research and Development -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials) -- Contains S-35	Scintillation Fluid	Bulk liquid	Toluene	0.0004	F005	S-35		0
Industrial -- Research & Development -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Biological research - LS counting of P-32 / S-35	Bulk Liquid	Toluene	2.095	F005	P-32, S-35	A	10.500
Government: -- Federal (hospital) -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Liquid scintillation counting	Bulk Liquid	Toluene, Xylene	0.582	F003, F005	H-3, C-14, Na-22, Ca-45, P-32, S-35	A	3.000
Medical (Non-Federal) -- Hospital <250 beds -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Research laboratory counting procedures	Bulk Liquid	Toluene, Xylene	3.880	F005, F003	S-35	A	0.000
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Waste from research. Commercial liquid scintillation solution.	Bulk Liquid	Ignitable	0.047	D001	Na-22, C-136	A	0.000
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C14 and tritium - (fluids or vials) - Flammable	Laboratory counting procedures	Bulk liquid	Xylene, Toluene	1.017	F003, F005	H-3, C-14, Ni-63	A	2.277

Table A-13. LSC waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic >20,000 students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C14 and tritium - (fluids or vials) - Flammable	Academic research laboratory counting procedures	Bulk Liquid	Xylene	0.096	F003	S-35	A	0.3
Academic <10,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing radioisotopes other than C14 and tritium - (fluids or vials) - Flammable	Laboratory counting procedures	Bulk liquid	Toluene, xylene	0.057	F005, F003	P-32	A	0.01
Medical (non-Federal) --Research - Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Bulk liquid (vials)	Toluene/xylene	30.618	F003, F005	H-3, C-14	A	22.1
Medical (non-Federal) --Research - Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Laboratory counting procedures	Bulk liquid (vials)	Toluene/xylene	2.525	F005, F003	P-32, S-35, I-125	A	11.9
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	General research studies	Bulk liquid in vials	Toluene, xylene	0.631	F005, F003	H-3, C-14	A	0
Academic 10,000-20,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures - liquid scintillation counting	Bulk LS Vials	Spent toluene mixture, spent xylene mixture	1.052	F005, F003	H-3, C-14	A	0.56
[illegible] - federal) - Medical college/hospital -- Large quantity generator (>1000 kg/month)	Liquids Sc[illegible]tion, containing C-14 and/or tritium -- (fluids or vials)	Medical researc[illegible]	Bulk/ vials	Toluene Xylene	18.920	F003, F005	H-3, C-14	A	31.9
Medical (non-federal) - Medical college/hospital -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Medical research	Bulk/ vials	Toluene, Xylene	2.867	F003, F005	Ca-45, P-32, S-35, Na-22	A	2.2
Academic 10,000-20,000 Students Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Bulked vials	Toluene, xylene	0.287	F005, F003	H-3, C-14	A	0.002
Academic 10,000-20,000 Students Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Laboratory counting procedures	Bulked vials	Toluene, xylene, pseudocumene	0.573	F005, F003, U055	H-3, C-14, P-32, S-35, Rb-86	A	3.07

Table A-13. LSC waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Research and Development -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Cock- tail vials	Fluids or vials	4.513	D001, F005	H-3, C-14	A	2
Industrial -- Research and Development -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Laboratory counting procedures	Cock- tail vials	Fluids or vials	0.106	D001, F005	S-35, C-136	A	0.03
Industrial -- Manufacturing (50-200 employees on site) -- No EPA Classification	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Fluids or vials	Toluene	3.518	F005	H-3	A	20
Academic >20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Liquid scintillation counting -- bioresearch	Fluids/ vials	Toluene, xylene	6.593	F003, F005	H-3, C-14	A	4.1586
Academic >20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Liquid scintillation counting -- bioresearch	Fluids/ vials	Toluene, xylene	0.287	F003, F005			
Government -- Federal (Research & Development) -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Containing isotopes other than 14C and 3H - laboratory research	Liq. scint. fluid		1.999	D001, F003, F005	H-3, C-14, S-35, I-125	A	0.025
Industrial -- Commercial radiopharmacy -- Large quantity generator (>1,000 kg/month)	Liquid Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Scintillation media for lab counting procedures	Liquid	Xylene, Methanol, Toluene	41.226	F003, F005, D001	H-3, C-14	A	22.900
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1000 kg/month)	Liquid Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Chemistry analysis	Liquid	Liquid scintillation	0.029	F003	H-3, C-14	A	0.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory measurements	Liquid	Scintillation cocktail	0.002	F003	H-3, C-14	A	0.000
Government -- Federal	Liquids Organic - (Solvents, chlorinated Solvents, etc.) -- Flammable	Chemical laboratory	Liquid	Liquid Scintillation	0.034	F003			
Government -- State -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or H-3 -- (fluids or vials) - Flammable	Analytical samples (water) and standards	Liquid	Ignitability	0.104	D001	H-3, C-14	A	0

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or H-3 -- (fluids or vials) - Flammable	Liquid scintillation counting, organic, hazardous waste	Liquid	Toluene	3.121	F005			
Industrial -- Research & Development	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Waste from research	Liquid	LSC	2.111	F003, F005	H-3, C-14	A	2,500.000
Industrial -- Research and Development -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Liquid	Liquid scintillation cocktail (Benzene)	29.688	F003, F005, D018	H-3, C-14, S-35	A	270
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Liquid	Waste toluene	40.020	F003	H-3, C-14	A	260.1
Academic -- <10,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	H-3 and C-14 - molecular biological research	Liquid	Liquid Scintillation Fluid	2.095	F005	H-3, C-14, S-35	A	125.000
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Wipe tests and laboratory counting	Liquid	Toluene, Xylene	4.485	F005, F003	H-3, C-14	A	89.250
Academic >20,000 students	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research laboratories	Liquid	Toluene, xylene	6.593	F005, F003	H-3, C-14, P-32, S-35, I-125, Na-22, Rb-86, C-136	A	82.753
Academic (<10,000 students) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Medical Research	Liquid	Toluene, xylene	17.487	F005, F003	H-3, C-14	A	62.736
Industrial -- Research and Development -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures (fluids or vials)	Liquid	Toluene	2.920	F005	H-3, C-14	A	61.8
Academic >20,000 students	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Liquid Scintillation vials	Liquid	Toluene, xylene	66.602	F005, F003	H-3, C-14	A	58.8
Medical (Non-Federal) -- Research -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Liquid	Ignitable	2.910	D001	H-3, C-14	A	50.000
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Vials (945 CU FT shipped during 1990	Liquid		36.120	F005, F003	H-3, C-14	A	50

Table A-13. LSC waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Assays (biological, chemical, immunological in vitro)	Liquid	Scintillation Fluid	1.862	F003	H-3	A	25.000
Industrial -- Manufacturing (<50 employees on site) -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Liquid	Xylene	1.396	F003	H-3	A	20.000
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Liquid scintillation analysis	Liquid	Xylene, Methanol, Toluene	13.266	F003, F005	H-3, C-14	A	15.310
Academic >20,000 students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Counting procedures	Liquid	Toluene, xylene	25.990	F005, F003	H-3, C-14	A	13.114
Academic <10,000 Students	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Liquid scintillation counting	Liquid	Scintillation cocktails	0.210	D001	H-3, C-14	A	12
Government -- Federal (Hospital) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Biomedical research in laboratories	Liquid	Toluene, xylene	2.198	F005, F003	H-3, C14, P32, S-35	A	11.912
Academic <10,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research or remediation of EPA Superfund site.	Liquid	Toluene, xylene	1.720	F003, F005	C-14, H-3	A	10
Industrial -- Research & Development -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	DNA, monoclonal antibody labelling, probes, etc.	Liquid	Xylene, Toluene	18.618	F005, F003	H-3, C-14	A	10.000
Academic >20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research	Liquid	Toluene	2.026	F005	C-14, H-3	A	8.916
Medical (non-Federal) --Research - Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Use of Old Scintillation	Liquid	Toluene, xylene	10.607	F003, F005	C-14, H-3	A	7.61
Academic 10,000-20,000 Students -- No EPA Classification	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Liquid	Aquasol, liquid scintillation fluid	0.989		H-3, C-14	A	7.314

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Manufacturing (<50 employees on site) -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Liquid	Flammables	4.573	F003, F005	H-3, C-14	A	6.918
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Waste from research laboratory counting procedures cleaning of laboratory equipment	Liquid	Toluene	7.639	F005	H-3, C-14	A	6.141
Academic <10,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	From research and teaching laboratories	Liquid	Toluene	2.841	F005	H-3, C-14, P-32, S-35, I-125	A	5.678
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	LSC Counting	Liquid	Methanol, Acetonitrile, Benzene, Acetone, Ethyl Acetate, Diethyl Ether, Toluene, Dichloromethane, Hexane, Pentane, Tetrahydrofuran	8.442	F003, U003, F005, F003, U080, U213	C-14	A	5.000
Industrial -- Research and Development -- Conditionally exempt small quantity generator (>100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Scintillation fluids	Liquid	Toluene	1.319	F005		A	4.983
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Counting procedures	Liquid	Toluene, xylene	3.478	F005, F003	H-3, C-14	A	4.05
Industrial -- Research & Development	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	From toxicology research	Liquid	Toluene	3.785	F005	C-14	A	4.000
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Waste from research, lab counting procedures, cleaning, decontamination, etc.	Liquid	Ignitable, toluene, xylene	2.580	F005, F003	H-3, C-14	A	3.98
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Liquid scintillation fluid components	Liquid	Toluene, xylene	3.091	F005, F003	H-3, C-14	A	3.66

Table A-13. LSC waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Government -- State -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Scintillation counting	Liquid	Xylene	5.667	F003	H-3, C-14	A	3.63
Medical (Non-Federal) -- Medical College/Hospital -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research	Liquid	Toluene, Xylene	0.776	F005, F003	H-3, C-14	A	3.400
Medical (Non-Federal) -- Medical College/Hospital -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting	Liquid	Toluene, Xylene	0.013	F005, F003	H-3, C-14	A	3.319
Medical (Non-Federal) -- Medical College/Hospital -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research, LSC counting	Liquid	Toluene	2.037	F005	H-3, C-14	A	3.300
Academic <10,000 Students -- No EPA Classification	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Liquid scintillation counting - education - 3H and 14C	Liquid		0.021	D001	H-3, C-14	A	3
Government -- Federal (Military) -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures and radiation safety surveys	Liquid	Toluene, Xylene	3.950	F005, F003	C-14, H-3	A	2.592
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Biology counting procedures	Liquid	Toluene, xylene	0.473	F003, F005	H-3, C-14, P-32, S-35, I-125	A	2.35
Industrial -- Manufacturing (50-200 employees on site) -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Diagnostic QC	Liquid	Toluene	0.528	F005	H-3	A	2.000
Industrial -- Research & Development -- Small quantity generator (<100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Liquid	Toluene, Sodium Azide	7.634	F005, P105	H-3	A	1.690
Academic <10,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Lab counting procedures	Liquid	Toluene	2.536	F005	H-3, C-14	A	1.3
Academic >20,000 students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	11.5 cu ft -- Laboratory counting procedures	Liquid	Toluene, xylene	0.440	F005, F003	H-3, C-14	A	1.123

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Quantities of C-14	Liquid	Toluene	0.011	F005	C-14	A	1.000
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Education and research experiments	Liquid	Toluene	0.191	F005	C-14, H-3		1
Government -- Federal (hospital)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Medical research. In-vitro diagnostic testing	Liquid	Toluene	1.164	F005	H-3, C-14	A	1.000
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Liquid scintillation counting	Liquid	Toluene	0.947	F005	H-3, C-14	A	0.756
Government -- Federal (Research & Development) -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Waste from Research	Liquid	Xylene, toluene	0.137	F003, F005	H-3, C-14	A	0.551
Industrial -- Research & Development -- Small quantity generator (<100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)		Liquid	Isoamylalc, Toluene	0.698	F005, D001	H-3	A	0.540
Medical (Non-Federal) -- Hospital 250-750 beds -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Liquid	Toluene/Xylene	1.164	F003, F005	H-3, C-14	A	0.521
Medical (Non-Federal): -- Hospital >750 beds -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Liquid scintillation fluids	Liquid	Xylene	0.155	F003	H-3, C-14	A	0.510
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research	Liquid	Toluene, xylene	0.126	F005, F003	H-3, C-14	A	0.5
Medical (non-Federal) Hospital (250-750 beds) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory procedures	Liquid	Toluene	0.287	F005	H-3	A	0.5
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research and counting	Liquid	Toluene	0.253	F005	H-3, C-14, S-35	A	0.453

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Medical (Non-Federal) -- Hospital >750 beds -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Lab counting procedures	Liquid	Toluene	1.824	F005	H-3, C-14	A	0.410
Government -- Federal (Research & Development) -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory research practices	Liquid	Xylene	1.561	U239	H-3, C-14	A	0.4
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research and development	Liquid	Xylene	2.793	F003	C-14	A	0.357
Academic 10,000-20,000 Students	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory instruction and research	Liquid	Toluene	0.011	F005	H-3, C-14	A	0.3
Industrial -- Research & Development	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Scintillation fluids.	Liquid	Xylene, Toluene	0.186	F003, F005	H-3, C-14		0.250
Industrial -- Research & Development -- Small quantity generator (<100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)		Liquid	Toluene	1.396	F005	H-3	A	0.160
Industrial -- Manufacturing (<50 employees on site) -- No EPA Classification	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Primary constituent	Liquid	Toluene	0.035	F005		A	0.1
Medical (Non-Federal) -- Research	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Liquid	Toluene	0.291	F005	H-3, C-14, S-35, P-32	C	0.100
Academic >20,000 students	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research.	Liquid	Pseudocumene	0.382	D001	H-3, C-14, S-35	A	0.1
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Biological research	Liquid	Toluene	0.084	F005	H-3, C-14	A	0.06
Government -- Federal (Research & Development) -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Process research	Liquid	Xylene	0.017	F003	H-3, C-14	A	0.04

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Medical (Non-Federal) -- Hospital 250-750 beds	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedure	Liquid	Toluene	0.291	F005	H-3, C-14		0.040
Industrial -- Research and Development -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research and development	Liquid	Toluene	0.528	F005	C-14	A	0.040
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	3H and 14C counting procedures on research materials	Liquid	Toluene	0.084	F005	H-3, C-14	A	0.02
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Lab waste from teaching and research	Liquid	Non halogenated solvent	0.084	F003, F005	H-3, C-14	A	0.02
Academic 10,000-20,000 Students -- No EPA Classification	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research	Liquid	Xylene	0.096	F003	C-14	A	0.016
Academic <10,000 Students -- No EPA Classification	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Containing C-14 Label	Liquid	Benz(A)anthracene, benzo(A)pyrene	0.071	U018, U022	C-14		0.005
Academic <10,000 Students -- No EPA Classification	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Lab Assay	Liquid	Toluene	0.007	F005	H-3, C-14	A	0.003
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Counting samples experimental C14/H3 productivity samples	Liquid	Toluene, xylene	1.871	F003, F005	H-3, C-14	A	0
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Lab counting procedures	Liquid	Toluene, xylene	0.516	F005, F003	C-14, H-3	A	0
Academic <10,000 Students	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Lab counting procedures	Liquid	Toluene	0.145	F005	H-3, C-14	A	0
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting	Liquid	Toluene, Xylene	1.396	F005, F003	H-3, C-14	A	0.000
Government -- State -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Liquid	Toluene, xylene	0.010	F003, F005	H-3, C-14	A	0

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Manufacturing (>200 employees) -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Liquid	Toluene, Xylene	0.264	F005, F003	C-14, -32, S-35	A	0.000
Academic 10,000-20,000 Students	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Liqu scintillation counting	Liquid	Xylene, toluene	0.071	F005, F003	H-3, C-14	A	0
Industrial -- Research & Development -- Conditionally exempt small quantity generator (<100 kg/month)	s Scintillation, containing C-14 and/or tritium -- (fluids or vials)	qu scintillation counting of laboratory samples	Liquid	Toluene, Xylene	0.528	F005, F003	H-3, C-14	A	0.000
Medical (non-federal) - Medical college/hospital -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research	Liquid	Scintillation fluid	1.473	D001	H-3, C-14	A	0
Academic <10,000 Students -- No EPA Classification	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research	Liquid		0.007		H-3, C-14		0
Industrial -- Research & Development	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Sample preparation and analysis	Liquid	**	2.793	F002, F003	C-14	A	0.000
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Tissue oxidizer, HPLC counting	Liquid	Toluene, ignitability	1.665	F005, D001			0
Academic <10,000 Students -- No EPA Classification	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Waste from lab counting procedures	Liquid	Xylene, toluene	0.505	F005, F003	H-3, C-14	A	0
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Counting procedure	Liquid		0.253	D001			
Medical (Non-Federal) -- Hospital	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Lab counting procedures	Liquid		0.608		H-3, C-14		
Medical (Non-Federal) -- Medical College/Hospital	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedure	Liquid		9.009				

Table A-13. LSC waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Liquid	Toluene	0.004	F005			
Medical (Non-Federal) -- Medical college/hospital	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Liquid		4.695				
Medical (Non-Federal) -- Medical college/hospital	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Liquid		0.287				
Medical (Non-Federal) -- Medical college/hospital	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Liquid		3.783				
Medical (Non-Federal) -- Hospital	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Liquid scintillation counting	Liquid		1.164		H-3, C-14, I-125, I-131, S-35, P-32		
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Physiological and biochemical experiments	Liquid	Toluene	0.084	F005			
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials) -- Deregulated Liquid Scintillation Vials	Laboratory counting procedures. Liquid scintillation fluid	Liquid	Waste flammable liquid	4.013	D001	H-3, C-14	A	14
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials) -- Flammable	Research waste	Liquid	Scintillation Fluid	133.373	D001, F001, F003, F005	H-3, C-14	A	25.970
Medical (Non-Federal) -- Research -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials) -- flammable	Counting samples	Liquid	Liquid Scintillations	1.552	F005	H-3, C-14	A	12.880
Industrial -- Research & Development -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials) -- Flammable	Laboratory counting procedures	Liquid	Characteristic	0.025	D001	H-3, C-14	A	0.016
Medical (Non-Federal) -- Hospital >750 beds -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials) -- flammable	Patient diagnostic procedures, laboratory counting procedures, biomedical research, equipment quality control	Liquid	Xylene	0.155	F003	H-3	A	0.002

Table A-13. LSC waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials) -- Flammable	Research	Liquid		0.352	D001, F003	H-3, C-14	A	0
Industrial -- Research & Development (not-for-profit research & development lab) -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials) -- Flammable	Waste from TCLP, oxidation and counting procedures	Liquid	Xylene, Methanol, Toluene	0.698	F003, F005	C-14, H-3		0.000
Academic >20,000 students -- No EPA Classification	Liquids Scintillation, containing C14 and tritium - (fluids or vials) - Flammable	Waste from research, lab counting procedures, decontamination	Liquid	Xylene, toluene	22.799	F003, F005	H-3, C-14	A	201.9337
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C14 and tritium - (fluids or vials) - Flammable	Laboratory counting procedures	Liquid	Xylene, toluene	0.537	F003, F005	H-3, C-14	A	1.576
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C14 and tritium - (fluids or vials) - Flammable	Waste from research	Liquid	Toluene, xylene	2.525	F005, F003	H-3, C-14	A	0.52
Academic 10,000-20,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C14 and tritium - (fluids or vials) - Flammable	LSC, C14/H3	Liquid	Toluene	0.229	F005	H-3, C-14	A	0
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Laboratory counting procedures	Liquid	Waste toluene	21.548	F003	H-3, C-14, S-35,P-32, I-125	A	295.4
Academic >20,000 students	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Liquid scintillation vials	Liquid	Toluene, xylene	17.045	F003, F005	Ca-45, C-136, Cr-51, I-125, I-131, In 111, Na-22, P-32, Rb-82, Rb-86, S-35, Sc-46	A	65.3
Academic 10,000-20,000 Students -- No EPA Classification	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Laboratory counting procedures	Liquid	Aquasol liquid scintillation fluid	0.821		H-3, C-14, Ca-45	A	17.149
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Physiological and biochemical experiments	Liquid	Toluene	0.084	F005	P-32	A	15
Academic >20,000 students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Counting procedures	Liquid	Toluene, xylene	3.713	F005, F003	P-32, S-35, Ca-45, Rb-86	A	8.713

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic >20,000 students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Scintillation counting media from research	Liquid	Toluene, xylene	0.307	F005, F003	H-3, I-125, Na-22, S-35, P-32	A	7
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Waste from research, lab counting procedures, cleaning, decontamination, etc.	Liquid	Ignitable, toluene, xylene	0.573	F005, F003	P-32, S-35, C-136	A	4.98
Government -- Federal (Military) -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Laboratory counting procedures and radiation safety surveys	Liquid	Toluene, xylene	2.988	F005, F003	P-32, S-35, I-125, Ca-45	A	4.426
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Counting procedures	Liquid	Xylene	3.478	F003	H-3, P-32, S-35	A	2.97
Academic >20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Research	Liquid	Toluene	0.573	F005	C-14, H-3, P-32	A	1.803
Academic 10,000-20,000 Students -- No EPA Classification	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Research	Liquid	Xylene	0.096	F003	S-35	A	1.5
Academic <10,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Lab counting procedures	Liquid	Toluene	2.536	F005	P-32, S-35	A	1.3
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Biology counting procedures	Liquid	Toluene, xylene	0.473	F003, F005	H-3, C-14, P-32	A	0.85
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Research	Liquid	Toluene, xylene	0.042	F005, F003	P-32, Ca-45	A	0.5
Academic >20,000 students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	7.5 cu ft -- laboratory counting procedures	Liquid	Toluene, xylene	0.287	F005, F003	Ca-45	A	0.437
Academic 10,000-20,000 Students	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Laboratory instruction and research	Liquid	Toluene	0.004	F005	S-35	A	0.1

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Manufacturing (<50 employees on site) -- No EPA Classification	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Primary constituent	Liquid	Toluene	0.035	F005		A	0.1
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Waste from research laboratory counting procedures cleaning of laboratory equipment	Liquid	Toluene	0.631	F005	Na-22, S-35, C-136, Ca-45, I-125	A	0.058
Academic <10,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Liquid scintillation counting	Liquid	Toluene, xylene	0.287	F003, F005	S-35, I-125	A	0.05
Government -- State -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Scintillation counting	Liquid	Xylene	0.258	F003	H-3, C-14, S-35	A	0.04
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	32P and 35S counting procedures on research materials	Liquid	Toluene	0.042	F005	P-32, S-35	A	0.007
Government -- Federal (Research & Development) -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Waste from Research	Liquid	Xylene, toluene	0.137	F003, F005	S-35, Ca-45	A	0.005
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Lab counting procedures	Liquid	Toluene, xylene	0.344	F005, F003	P-32. S-35	A	0
Academic 10,000-20,000 Students	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Liquid scintillation counting	Liquid	Xylene, toluene, naphthalene, dioxane	0.071	F005, F003, U165, U108	P-32, I-125, S-35, Cr-51	A	0
Government -- Federal (Hospital) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Biomedical research in laboratories	Liquid	Toluene, xylene	1.030	F005, F003			
Academic >20,000 students	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Research laboratories	Liquid	Toluene, xylene	45.293	F005, F003			
Academic 10,000-20,000 Students	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Research laboratory counting procedures	Liquid		0.042	D001			

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Tissue oxidizer, HPLC counting	Liquid	Toluene, ignitability	1.665	F005, D001			
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials) - Regulated liquid	Laboratory counting procedures	Liquid	Waste flammable liquid	2.867	D001	H-3, C-14, P-32, S-35, I-125, Cr-51, Na-22, C-136, Ca-45	A	52
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials) -- Flammable	Research	Liquid		0.354	D001, F003	P-32	A	0
Academic <10,000 Students	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials) -- S-35	Lab counting procedures	Liquid	Toluene	0.072	F005	S-35	A	0
Industrial -- Manufacturing (>200 employees) -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Liquid	Toluene, Xylene	0.264	F005, F003	Am-241	A	6,000.000
Medical (Non-Federal) -- Medical College/Hospital -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Research	Liquid	Toluene, Xylene	31.971	F005, F003	H-3, C-14, P-32, S-35, I-125, Ca-45	A	139.400
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Liquid scintillation analysis	Liquid	Xylene, Methanol, Toluene	6.982	F003, F005	H-3, C-14, P-32, Ca-45, Rb-86, I-125, S-35	A	112.110
Medical (Non-Federal) -- Research -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Liquid	Ignitable	5.238	D001	I-125, P-32, S-35	A	100.000
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)		Liquid	Toluene	2.111	F005	P-32, S-35, H-3	A	70.000
Industrial -- Research & Development	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)		Liquid	Alkylbenzene	0.019	F005	C-14	A	12.100

Table A-13. LSC waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Medical (Non-Federal) -- Research -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Sent to Quadrax via broker - no drain disposal for biodegradable	Liquid	Toluene	7.415	F005	I-125, P-32, Ca-45, S-35, Cr-51	A	5.900
Industrial -- Research & Development -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	DNA. monoclonal antibody labelling, probes, etc.	Liquid	Xylene, Toluene	4.655	F005, F003	Cr-51, P-32, I-125	A	5.000
Medical (Non-Federal) -- Medical College/Hospital -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Laboratory counting	Liquid	Toluene, Xylene	0.013	F005, F003	C-14, H-3, P-32, S-35, C-136, Na-22	A	3.006
Industrial -- Research & Development	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Scintillation fluids.	Liquid	Xylene, Toluene	0.186	F003, F005	H-3, P-32		0.500
Government -- Federal (hospital)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Medical research, radiation safety, RIA lab.	Liquid	Toluene, Xylene	2.018	F005, F003	H-3, C-14, P-32, S-35, Rb-86, I-125	A	0.280
Industrial -- Commercial Radiopharmacy -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Scintillation media for lab counting procedures	Liquid	Methanol, Toluene	0.176	F003, F005, D001	Ca-45	A	0.246
Industrial -- Waste broker / processor -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Lab operations	Liquid	LSC Mixture containing Xylene	3.166	D001, F003	H-3, C-14, P-32, S-35, Na-22	A	0.178
Government -- Federal (hospital) -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Liquid scintillation fluid	Liquid	Toluene	0.610		S-35	A	0.035
Industrial (not for profit toxicological research institute) -- Conditionally exempt small quantity generator (< 100 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Liquid	Pseudocumene	1.583	D001	P-32. S-35		0.000
Medical (Non-Federal) -- Medical college/hospital	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Laboratory counting p	Liquid		0.287				

Table A-13. LSC waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Research & Development -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials) -- Flammable	Laboratory counting procedures	Liquid	Characteristic	0.012	D001	P-32	A	20.500
Medical (Non-Federal) -- Research -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials) -- Flammable	Counting samples	Liquid	Liquid Scintillations	0.776	F005	Ca-45	A	13.780
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials) -- Flammable	Research waste	Liquid	Scintillation Fluid	4.236	D001, F001, F003, F005	P-32, I-125, S-35	A	0.020
Industrial -- Waste Broker/Processor -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials) -- Flammable	Liquid scintillation counting (oil / organic-based samples)	Liquid	Xylene	0.070	F003	H-3, C-14	A	0.000
Industrial -- Research & Development	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials) -- Toxic	Scintillation cocktail	Liquid	Methyl Ethyl Ketone	2.793	D035	C-14	A	1.000
Academic >20,000 students -- No EPA Classification	Liquids Scintillation, containing radioisotopes other than C14 and tritium - (fluids or vials) - Flammable	Waste from research, lab counting procedures, decontamination	Liquid	Xylene, toluene	22.780	F003, F005	I-124, P-32, Cr-51, S-35, Ca-45, Cd-109	A	214.44
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C14 and tritium - (fluids or vials) - Flammable	Laboratory counting procedures	Liquid	Xylene, toluene	0.316	F003, F005	S-35, P-32	A	0.586
Academic 10,000-20,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing radioisotopes other than C14 and tritium - (fluids or vials) - Flammable	LSC, S35	Liquid	Toluene	0.057	F005	S-35	A	0
Academic >20,000 students -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation (non-exempt), containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Research	Liquid	Toluene	2.007	F005	H-3, C-14, S-35, Ca-45	A	5
Academic (10,000-20,000 students) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research laboratory waste	Liquid (vials)	Toluene, xylene, methanol	12.690	F005,F003	C-14, H-3	A	6.6

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic (10,000-20,000 students) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Research laboratory waste	Liquid (vials)	Toluene, xylene, methanol	8.447	F005,F003	H-3, P-32, S-35, I-125	A	45
Academic <10,000 Students -- No EPA Classification	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Scintillation Cocktail	Liquid 32P	Xylene	0.063	F003	P-32	A	5
Academic <10,000 Students -- No EPA Classification	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Counting procedures/ research	Liquid 35S	Toluene	0.084	F005	S35	A	10
Academic <10,000 Students -- No EPA Classification	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials) - S35	Counting procedures/ research	Liquid 3HP	Xylene	0.042	F003	H-3	A	0.75
Academic 10,000-20,000 Students -- Large quantity generator (1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research	Liquid bulk	Toluene, xylene	0.338	F005, F003	H3	A	0.95
Government -- Federal (hospital) -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Below 0.05 NC/G counting-specimen assay H-3, C-14, P-32	Liquid Bulk	Toluene	5.701	F005	H-3, C-14	A	0.730
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Scintillation cocktail	Liquid bulk	Pseudocumene	0.416	D001			
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	3H and 14C vials	Liquid in vial	Toluene, xylene	0.042	F005, F003	H-3	A	0.1
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Liquid scintillation counting	Liquid in Vials	Scintillation solution containing Xylene, Toluene, Pseudocumene or related Hydrocarbons	33.513	F003, F005	C-14	A	43.000
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Liquid in Vials	Toluene	2.095	F005	H-3, C-14	A	1.000
Academic 10,000-20,000 Students -- No EPA Classification	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures, commercial scintillation cocktails	Liquid in vials	Scintillation fluids, may contain toluene, xylene, etc.	0.287	F005, F003	H-3, C-14	A	0.2

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Manufacturing (<50 employees on site) -- Small quantity generator (100-1,000	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting	Liquid in Vials	Toluene	0.698	F005	H-3, C-14	A	0.005
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Waste from research	Liquid in vials	Toluene, xylene	3.788	F005, F003	H-3, C-14	A	0
Medical (Non-Federal) -- Medical College/Hospital	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Lab counting procedures	Liquid in vials		0.030				
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials) -- flammable	Laboratory counting procedures	Liquid in Vials	Xylene, Toluene, Mineral Spirits	2.095	D001, F003, F005	H-3, C-14	A	2.759
Medical (Non-Federal) -- Hospital 250-750 beds	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials) -- Flammable	Lab counting procedures	Liquid in Vials	Xylene	0.155	F003	H-3, C-14	A	0.100
Medical (non-Federal) --Research - Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Basic biomedical research and education	Liquid in vials	Toluene/xylene	2.867	F003, F005	H-3, C-14, Na-22, Ca-45, S-35	A	0.52
Government -- Federal (Research & Development) -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Biomedical research	Liquid in vials/ bulk	Liquid scintillation fluids, toluene, xylene	112.620	D001, F005, F003	H-3, C-14	A	52.2
Government -- Federal (Research & Development) -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Biomedical research	Liquid in vials/ bulk	Liquid scintillation fluids, toluene, xylene	93.684	D001, F005, F003	P-32, S-35	A	11.3
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Bulk liquid and scintillation vial contained LSC cocktail containing less than 0.05 microcuries/ML	Liquid Scintilla-tion	Xylene	20.247	F003	C-14	A	43.500
Medical (Non-Federal) -- Hospital 250-750 beds -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Liquid Scintilla-tion	Toluene	5.405	F005	H-3, C-14	A	20.247
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Waste from research	Liquid Scintilla-tion	Toluene	8.239	F005	H-3, C-14	A	11.000

Table A-13. LSC waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Radioisotopic biochemical assays	Liquid Scintillation	Benzo(A)pyrene	0.172	U022	H-3		0.163
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials) -- Flammable	Scintillation vials generated from wipe tests / protein assays	Liquid Scintillation	Toluene	9.076	F005	C-14, H-3	A	158.550
Medical (Non-Federal) -- Medical College/Hospital	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research lab counting	Liquid Scintillation Vials	Toluene, Xylene	18.288	F005, F003	H-3, C-14	A	6.797
Medical (Non-Federal) -- Hospital 250-750 beds	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Lab counting procedures	Liquid Scintillation Vials	Toluene	7.981	F005	H-3, C-14	A	0.007
Medical (Non-Federal) -- Medical College/Hospital	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Radioactive vial other than DE-REG H-3 - C-14, research lab counting procedures	Liquid Scintillation Vials	Toluene, Xylene	24.383	F005, F003	H-3, C-14, P-32, S-35, Cr-51, Fe-59, Ca-45	A	10.221
Medical (Non-Federal) -- Medical College/Hospital -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Medical research	Liquid Scintillation Vials	Toluene, Benzene, Acetone, Methanol, Xylene	36.484	F003, F005	H-3, C-14, Ca-45, I-125, P-32, S-35	A	237.340
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research	Liquid vials	Toluene, xylene	13.953	F005, F003	H-3, C-14	A	18.99
Academic 10,000-20,000 Students -- Conditionally exempt small quantity generator	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Counting procedures, 14C and 3H	Liquid vials		0.631	F003, F005	H-3, C-14	A	8.9
Academic 10,000-20,000 Students -- Large quantity generator (1000 g/mon	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research	Liquid vials	Toluene, xylene	1.263	F005, F003	C-14	A	1.5815
Industrial -- Research & Development -- quantity generator (100-1,000 kg/month	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Counting procedures	Liquid	Xylene	3.166	F003	H-3	A	0.000
Students	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting	Liquid vials	Scintillation fluids	0.214	D001			

Table A-13. LSC waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Research	Liquid vials	Toluene, xylene	8.002	F005, F003	P-32, S-35	A	27.62
Academic 10,000-20,000 Students -- Conditionally exempt small quantity generator	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Counting procedures, other isotopes	Liquid vials		0.631	F003, F005	H-3, Ca-45, Cr-51	A	8.9
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	C14,3H xylene base laboratory counting procedures pseudocumene base	Liquid/ vials	Xylene	0.780	F003			
Academic >20,000 students	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Research	Liquid/ vials	Toluene, xylene	1.578	F005, F003	C-14, H-3, I-125	A	0
Academic <10,000 Students - Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Counting procedures	Liquids	Toluene	0.631	F005	H-3, C-14	A	20
Academic <10,000 Students - Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Counting procedures	Liquids	Toluene	0.631	F005	P-32, S-35, I-125	A	1
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Bulk liquid and scintillation vial contained LSC cocktail containing less than 0.05 microcuries/ML	Liquid Scintilla-tion	Toluene	20.247	F005	C-14	A	43.500
Medical (Non-Federal) -- Research -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Liquid scintillation	LSC	Toluene	0.776	F005	H-3	A	23.000
Industrial	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)		LSC		0.517				
Medical (Non-Federal) -- Research -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Liquid scintillation fluids	LSC	Toluene	0.466	F005	Ca-45	A	4.000
Medical -- Hospital	LSC		LSC w/ I125		0.365				

Table A-13. LSC waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Medical (Non-Federal) -- Medical College/Hospital -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research waste	LSV	Xylene, Toluene, Ignitable	1.630	D001, F003, F005	H-3, C-14	A	5.000
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Research	LSV		0.267	D001, F005	H3, C14		0
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Waste from research	LSV	Toluene/xylene	4.209	F005, F003	H-3, C-14	A	0
Medical (Non-Federal) -- Medical College/Hospital -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials) -- flammable	Waste from research	LSV	Toluene	1.455	F005	H-3, C-14	A	1.785
Industrial -- Research and Development -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials) -- Flammable	Commercial source	LSV	Trimethylbenzene	2.902			A	0.236
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Waste from research	LSV	Toluene/Xylene	3.998	F005, F003			
Medical (Non-Federal) -- Medical College/Hospital -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Research waste	LSV	Xylene, Toluene, Ignitable	1.630	D001, F003, F005	S-35, Ca-45	A	18.000
Medical (Non-Federal) -- Medical College/Hospital -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials) -- Flammable	Waste from research	LSV	Toluene	0.873	F005			
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C14 and tritium - (fluids or vials) - Flammable	Laboratory counting procedures	LSV's	Toluene, xylene	27.520	F003, F005	H-3, C-14	A	57.4
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C14 and tritium - (fluids or vials) - Flammable	Laboratory counting procedures (Isotopes other than H3, C14)	LSV's	Toluene, xylene	4.300	F003, F005	P-32, S-35, Ca-45, I-125	A	10.5
Academic >20,000 students -- Small quantity generator (100-1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and H-3 -- (fluids or vials) --	Research generation of the three waste streams listed	Non aqueous fluid	Toluene	0.205	F005	P-32	A	2

Table A-13. LSC waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Research activities - sample counting	Vials Liquid	Toluene	17.031	F005	C-14, S-35, I-125	A	5.000
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Counting and research	Vials, absorbent	Xylene	0.287	F003	H-3, C-14	A	0.039
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	Counting and research	Vials, absorbent	Xylene	0.287	F003	C-136	A	0.001
Industrial -- Research and Development -- No EPA Classification	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	LS counting of vials in laboratories	Vials/ Liquid	Alkorganino	0.264	D001	C-14	A	0.002
Medical (Non-Federal) -- Medical College/Hospital	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting			11.249				
Medical (Non-Federal) -- Medical College/Hospital	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting			22.802				
Medical (Non-Federal) -- Medical College/Hospital	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting			11.401		H-3, C-14		
Academic >20,000 students	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	LSC			42.087				
Government -- Federal (Research & Development)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	LSC			0.766				
Industrial	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	LSC			0.689				
Industrial -- Research and Development	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	LSC			0.354				
Government -- Federal	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)			LSC	0.156				
Government -- Federal (Research and Development)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)			LSC	3.850				
Government -- Federal (Military)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)			LSC	57.435				

Table A-13. LSC waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)			LSC	9.521				
Industrial -- Research & Development -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials) -- Flammable	Liquid scintillation procedure (counting)		LSC	3.166		C-14	A	6.700
Academic >20,000 students	Liquids Scintillation, containing radioisotopes other than C-14 and tritium -- (fluids or vials)	LSC with P32, I125, Ca45, S35			21.213		P-32, I-125, CA-45, S-35		
Academic > 20,000 students --	LSC	LSC			1.464				
Industrial	LSC	LSC			0.258				
Industrial	LSC	LSC			0.326				
Industrial	LSC				2.793				
Industrial	LSC				2.756				
Industrial	LSC				0.317				
Industrial -- Commercial Radiopharmacy	LSC				0.689				
Industrial	LSC				0.344				
Industrial	LSC				0.251				
Medical -- Medical College/Hospital	LSC			LSC	1.723				
Medical (non-federal)	LSC				0.058				
Medical (non-federal)	LSC				23.551				
Medical (non-federal)	LSC				0.031				
Industrial	Other (misc.)				0.093				
Academic	Other (Specify) -- LSC			LSC	0.156				
Academic	Other (Specify) -- LSC			LSC	0.156				
Academic	Other (Specify) -- LSC				0.631				
Academic	Other (Specify) -- LSC				1.263				
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Other (Specify) -- LSC				0.631				
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Other (Specify) -- LSC				45.117				
Industrial -- Commercial Radiopharmacy	Other (Specify) -- LSC			LSC	2.638				
Government -- Federal (Research & Development)	Other - LSC	LSC			0.021				

Table A-14. Multi-code waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- (Specify) -- NICD Batteries	Maintenance of emergency lighting equipment	Solid / liquid	Corrosive liquid, cadmium	0.145	D002, D006	Co-60, Cs-134, Cs-137		0.000
Academic <10,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Discarded radiochemicals used in research	Liquid - small vials	Various	0.021	D001, F003, F005	H-3, C-14	A	40
Government -- Federal (Research & Development) -- Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Laboratory research	Un-compacted solid		73.281	D001, D002, D003, F002, F003, F005, U003, U022, U168, U089, U221	H-3, C-14, S-35, P-32, I-125	A	1.3
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Filter Media -- Dewatered	Filter bags	Un-compacted solid	Processing used oil / lead / solvent for energy recovery	0.218	D008, F001, F002, F003, F005	Co-60, Cs-137, Cs-134		0.000
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste: Shielding	Expended penetration shielding	Solid	Lead, acetone, methyl ethyl ketone	0.218	D008, F003,	Mn-54, Co-60, Fe-59	A	1.940
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Mixed solvents	Absorbed liquid	Methanol, benzene, chloroform	0.084	D022, F003,	H-3, C-14, Ni-63	A	3173.35
Nuclear Reactor Facility -- Boiling Water Reactor -- **Large quantity generator (>1000 kg/month)**	Liquid Aqueous -- Solidified	Decontamination	Liquid	1,1,1-trichloroethane, trichlorofluoroethane, trichlorofluoro-methane, methyl ethyl ketone, toluene	0.654	F001, F002, F005	Co-60, Cs-134, Cs-137, Zn-65	A	0.036
Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Liquid Organic - (Solvents, Chlorinated Solvents, etc.) -- Flammable	Research waste	Liquid	Solvents	0.856	D001, F001, F003, F005	H-3, S-35	A	0.560

Table A-14. Multi-code waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generator (100-1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	solvent cleaning bottoms	Bulk liquid	1, 1, 2-trichloro-1, 1, 2-trifluoroethane, 1, 1, 1-trichlorethane, acetone, toluene, cadmium, chromium, lead	0.145	F002, F003, F005, D006, D007, D008	Co-60, Cs-134, Cs-137	A	0.007
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Solvents used in cleaning machine parts, laundry and decontamination	Bulk liquid	Spent halogenated and non-halogenated solvents and chlorofluoro-carbons	21.386	F002, F003			
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generator (100-1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Solvents used for degreasing	Bulk liquids	1, 1, 2-trichloro-1, 1, 2-trifluoroethane, acetone, flammability, barium, cadmium, chromium, lead	0.058	F001, F003, D001, D005, D006, D007, D008	Co-60, Cs-134, Cs-137	A	0.003
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity reactor (>1000 kg/month)	Liquid organic -- (solvents, chlorinated solvents, etc.)	Cleaning Parts, Tools, etc.	Liquid	Alcohol, acetone, mineral spirits	0.654	U002, F001, F002			
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Maintenance activities	Solvent liquid	Ignitable, mercury, barium, lead, chromium, chloroform, 1, 1-dichloroethylene, tetrachloroethylene, dichloroethane, cadmium, methyl ethyl ketone	0.726	D001, D003 D009 D008, D005, D007, D022, D029, D039, D040, D028, D006, D035	Ni-63, Fe-59, Co-58, Fe-55, Mn-54, Sr-90, Nb-95, Tc-99, Cs-134, Sr-89, Cr-144	A	0.000
Industrial -- Manufacturing (50-200 employees on site) -- Large quantity generator (>1,000 kg/month)	Liquids Aqueous - Absorbed -- Corrosive	Radioanalytical laboratory procedures, laboratory counting procedures	Bulk Liquid	Corrosive, Lead	1.396	D002, D008	H-3, Sr-90	A	0.001
Academic <10,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Aqueous -- Absorbed (Long T1/2 - H-3, C-14, S 35 radioactive liquid)	From research and teaching laboratories	Liquid	Acetone, phenol, acetic acid, TCA, sulfuric acid, chloroform, carbon tetrachloride	2.841	F003, D002, D003, D022, F001, F002	H-3, C-14, P-32, S-35, I-125, Sr-90	A	13.33
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Research	Bulk liquid	Chloroform, acetone, hexane, isopropyl ether, methylene chloride	0.025	D022, F003, D001, F002	H-3, Co-60, Fe-59	A	1.01

Table A-14. Multi-code waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Sealed Source/Gauge/ Instrument User	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Spent reagents, mobile phases	Bulk Liquid	Chloroform, Xylene, Acetone, Ethyl Acetate, Ethyl Ether, Methanol, Toluene, Acetonitrile	2.793	F002, F003, F005, U003	C-14, H-3		2.800
Academic <10,000 Students	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Research	Bulk liquid	Methanol, acetic acid	0.042	F003, D003	Se-75	A	0.01
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Normal lab procedures - HPLC - sample workup	Bulk Liquid	Mixture	0.281	F001, F002, F003, D001, U003, U056	C-14	A	0.009
Industrial -- Decontamination facility & waste reduction -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Radiosynthesis and product purification	Bulk liquid	Spent solvents	0.215	D001, F003, F005		A	1035
Industrial -- Manufacturing (<50 employees on site) -- Large quantity generator (>1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Manufacture of radiolabeled compounds	Bulk Liquid	Waste Flammable Liquid	2.365	D001, F002, F003, F005			
Industrial -- Manufacturing (>200 employees) -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Expired product	Liquid	Corrosivity, reactivity, EP toxicity	0.791	D002, D003, D004-32	H-3, C-14	A	0.000
Academic >20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Research	Liquid	Metolalchor, methanol, methylene chloride	0.004	F003, F002			
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from manufacture of labeled compounds	Liquid	Organochlorides (methanol, ethyl acetate, xylene, n-hexane, acetone, acetonitrile, ethyl ether, butanol, toluene, benzene, pyridine, methyl ethyl ketone, pentane, acetic acid, tetrahydrofuran, acrylonitrile, cyclohexane	0.152	F003, D001, D018, D038, D035, D002	C-14	A	12397.9
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Biomedical Research laboratory	Organic liquids	Acetonitrile, xylene, methanol, chloroform	2.293	D001, F003, D022	H-3, C-14, S-35, P-32, I-125, Ce-141	A	20

Table A-14. Multi-code waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generator (100-1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Solvent-contaminated waste oil		Bulk liquid	1, 1, 2-trichloro-1, 1, 2-trifluorothane, 1, 1, 1-trichloroethane, chlorinated fluorocarbons, toluene, cadmium, chromium, lead, dichlorobenzene, methylene chloride, acetone, xylene	1.075	F001, F003, F005, D006, D007, D008, D027	Co-60, Cs-134, Cs-137	A	0.052
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generator (100-1000 kg/month)	Waste Oils (Seal Oils from pumps for example): Waste oil free from solvent contamination	Mixture with pump oil and laundry solvents	Liquid	Oil and Laundry solvents	0.218	F002, D008	Co-60, Ni-63	A	0.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Waste Oils -- Solvent Contaminated Waste Oil		Bulk liquid	Lead, oil, solvents and water	63.577	D008, F001, F002, F003, F005	Co-60, Cs-137, Cs-134		8.530
Academic >20,000 students -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.) - Flammable	Research	Liquid	Solvents	0.459	D001, F003, F005	H-3, C-14	A	125.934
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.) -- Flammable	Waste from research and service contract	Bulk Liquid	Methanol, Acetic Acid	0.099	D001, D002, F003	S-35	A	0.000
Academic <10,000 Students -- Large quantity generator (>1000 kg/month)	Other - (specify) - Soil contaminated with C14 and H3	Laboratory research	Bulk liquid	Methanol, toluene, xylene, ethyl ether 1, 1, 1-trichloroethane, carbon tetrachloride	8.800	F003, F005, F002, F001	H-3, P-32, S-35, Ca-45, Cr-41, Rb 86, I-125	A	200.476
Industrial -- Large quantity generator (>1,000 kg/month)	Other -- (Specify) -- Aqueous Corrosive, Hg, Se	Generated by analytical practices	Aqueous	Corrosive, Hg, Se	3.363	D002, D007, D006, D008,			
Government -- Federal (Military)	Waste Oils (Contains Lead Oxide)	Pump Oil		Lead oxide	0.004				

Table A-15. Miscellaneous waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic <10,000 Students - No EPA Classification	Liquids Aqueous -- Absorbed	Laboratory research	Absorbed liquid	Radionuclides	0.168		P-32, I-125	A	34
Academic >20,000 students	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Organic Extraction Solution			0.084				
Medical (Non-Federal) -- Medical	Other			Uranyl Nitrate, Uranyl Acetate	0.011				
Industrial -- Commercial Radiopharmacy	Other (Specify) -- Miscellaneous			Miscellaneous	0.264				
Academic >20,000 students - Large quantity generator (>1000 kg/month)	Radioactive Sealed Sources, Devices, or Gauges	Decommis-sioning instruments-sealed sources	Sealed sources	Sealed sourced	0.034		Ni-62, Cs-137, Pb-210, Co-60	A	0
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Radioactive Sealed Sources, Devices, or Gauges	Production sources waste	Sealed Sources	Sealed Sources - Nickel 63 and Americium 241	1.396		Ni-63, Am-241	B	200.000
Industrial -- Research & Development -- Conditionally exempt small quantity generator (<100 kg/month)	Incinerator Ash or Residuals	Incineration of animal tissues	Solid Uncompacted	Residual Soils	0.141		C-14	A	0.010
Medical (non-federal) -- Medical college/hospital	Other (Specify) -- Uranyl Acetate			Uranyl acetate	0.004				
Academic <10,000 Students - Large quantity generator (>1000 kg/month)	Other (specify) -- Solid Soil	Research	Solid soil	Soil	0.631				
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Paint (dried)	Maintenance activities	Solid	Dried paint	0.218		Co-60, Fe-55, Cs-134, Cs-137, Mn-54	A	0.002
Nuclear Reactor Facility -- Pressurized Water Reactor	Paint: Epoxy-based	Maintenance	Solid	Epoxy paint	0.003				

Table A-15. Miscellaneous waste generated in 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	lab experiments in biology and chemistry	Solid	Paper, plastic glass	0.316		35, I-125	A	1.7
Academic <10,000 Students - Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Laboratory research	Compacted	Compacted solid trash	23.674				
Industrial -- Sealed Source/Gauge/Instrument User	Trash and/or Solid Waste (not lead) -- compacted	Sample prep., cleaning, bench paper	Compacted Solid	Trash	1.396		C-14, H-3		10.000
Academic >20,000 students	Trash and/or Solid Waste (not lead) -- compacted		Uncompacted trash	Trash	0.382		H-3, C-14, P-32, S-35	A	0
Academic <10,000 Students - Conditionally exempt small quantity generator (<100 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	All generated from in vitro laboratory experiments only C14 and H3. All are deregulated waste.	Solid	Trash	0.316		H-3, C-14	A	0.5
Academic >20,000 students - Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Lab research and instructions	Solid	Trash	2.408		H-3, C-14, S-35, Cr. 51, P-32, Cd-109, Co-57, Zn-65	A	0
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Lab trash	Un-compacted solid	Trash	1.529		C-14, H-3		1
Industrial -- Research & Development -- Conditionally exempt small quantity generator (<100 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Laboratories wastes	Solid Non-compacted	Counting Fluid	4.327		C-14	A	39.800
Academic <10,000 Students	Trash and/or Solid Waste (not lead) -- non-compacted	Laboratory cleanup	Solid	Trash	0.073				
Academic <10,000 Students - No EPA Classification	Trash and/or Solid Waste (not lead) -- non-compacted	Laboratory research	Solid	Radionuclide	0.947		H-3, P-32, I-125	A	39

Appendices B-1 through B-16

Wastes Stored as of December 31, 1990

Table B-1. Ignitable waste stored as of December 31, 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic 10,000-20,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Biological Waste (Non-infectious)	Laboratory Counting Procedures. Decay	Absorbed	Tyrosine	0.191	D001	H-3	A	0.203
Academic 10,000-20,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Biological Waste (Non-infectious)	Laboratory Counting Procedures. Decay	Absorbed	Tyrosine	0.191	D001	H-3	A	0.203
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.) -- Safety Kleen	On-site storage for accumulation before ultimate off-site treatment or disposal	Aqueous	Safety Kleen	0.872	D001	Co-60, Co-58, Fe 55	A	0.680
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Accumulation for future treatment	Aqueous	Ethanol	0.063	D001	C-14, S-35, P-32	A	0.05
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Unable to treat, ship, dispose	Aqueous	Formaldehyde	0.021	D001	H-3, C-14	A	1
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from research	Aqueous	Methanol	0.042	D001			
Academic 10,000-20,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from research (permanent on-site storage)	Aqueous	Phenol	0.021	D001			
Academic <10,000 Students - Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from research lab. counting procedures	Bulk	Petroleum distillates	0.168	D001	H-3	A	0.025
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generated (100-1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Cleaning solvent	Bulk liquid	Petroleum distillate	0.073	D001	Co-60, Cs-137	A	10.000

Table B-1. Ignitable waste stored as of December 31, 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Medical (non-Federal) -- Research -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	No sub- stantial waste stored as of 12/90 except short half live (<90 days) aqueous liquids. Stored to reduce activity prior to drain discharge. They are stored tc comply with our internal policy to reduce drain discharges to lowest possible level.	Bulk liquid	Flammable liquid	0.115	D001	H-3, C-14	A	5.02
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Spent cleaning solvents. Storage for future treatment - **Unable to treat** or dispose of waste	Bulk Liquid	Solvent	2.203	D001	Co-60, Cs-137, Fe-55, Zn-65	A	0.000
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Storage for accumulation	Bulk Liquid	Tetrahydrofuran	0.698	D001	H-3	A	7.500
Academic <10,000 Students - Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Storage for accumulation	Bulk liquid	TNT	0.316	D001	C-14	A	0.029
Medical (Non-Federal) -- Medical **College/Hospital** -- Small quantity generator (100-	Liquids Organic -- (Solvents, Chlorinated **Solvents, etc.**)	Storage for decay; storage for off-site **treatment**	Bulk Liquid	Ignitable	0.078	D001	S-35, P-32	A	2.000
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Storage on-site for decay	Bulk Liquid	Formamide	0.042	D001	P-32	A	0.040
Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Stored until disposal option available	Bulk Liquid	Ignitability	0.372	D001	C-14	A	2.500
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Paint/solvent waste	Bulk liquids	Flammable solvents	13.802	D001			

Table B-1. Ignitable waste stored as of December 31, 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic <10,000 Students	Liquids Organic (Solvents, Chlorinated Solvents, etc.)	CIS-2-pentene	Liquid	CIS-2-pentene	0.010	D001	Na-22	A	1
Academic >20,000 students	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Misc. research	Liquid	D001	7.260	D001	Unknown	A	0
Academic <10,000 Students - Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Research - Superfund Remediation work. No way to dispose of (mixed LLRW)	Liquid	Coal tars/Naphthalene	0.229	D001	C-14, H-3	A	0.05
Industrial -- Waste Broker/Processor - Large quantity generator (>1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Storage for accumulation	Liquid	Ignitable Solvent	0.070	D001	Co-60, Cs-137	A	0.000
Industrial -- Research and Development -- Small quantity generator (100-1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Storage for accumulation - for disposal	Liquid	Flammables	0.299	D001	C-14	A	3.000
Industrial -- Research & Development	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Stored for accumulation	Liquid	Acetonitrile	1.489	D001			
Industrial -- Manufacturing (>200 employees on site) -- Small quantity generator (100-1,000	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Used in discontinued process. Storage for generator treatment	Liquid	Alcohol	9.309	D001	Th Natural	A	15.000
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.) - Flammable (not compacted)	Separation Media for HPLC. Storage for decay/separation	Liquid	Acetonitrile	0.038	D001	I-125	A	15
Medical (Non-Federal) -- Hospital >750 beds -- Large quantity generator (>1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.) -- Flammable	Decay in storage, accumulation	Liquid	Characteristic - Flash Point	11.401	D001	C-14, P-32, I-125		0.000
Industrial -- Research and Development -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	No known disposal method; decay	Liquid and absorbed liquid	Acetonitrile -- HPLC Solvent	0.281	D001	H-3, C-14, S-35, I-125	A	11

Table B-1. Ignitable waste stored as of December 31, 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic 10,000-20,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Laboratory Counting Procedures. Decay then to normal trash or to haz mat disposal	Liquid vials	Formaldehyde	0.038	D001	C-14	A	0.005
Academic <10,000 Students - Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Storage for accumulation - Waiting for shipment off-site	Liquid, small vials	Various	0.042	D001	H-3, C-14	A	40
Medical (Non-Federal) -- Research -- Large quantity generator (>1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Ethanol extractions from research. Storage for decay	Organic Liquid	Ignitable	0.004	D001	P-32	A	0.200
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Unable to treat, ship, or dispose of waste.	Solid	Ignitable solvent r	0.218	D001	Co-60, Fe-55, Cs-137, Cs-134	A	0.001
Medical (Non-Federal) -- Hospital 250-750 beds	Trash and/or Solid Waste (not lead) -- compacted	Storage for decay	Solid	**	0.291	D001	H-3, C-14	A	0.002
Academic <10,000 Students - Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Waste from Research/Cleaning of Lab Equipment. Storage for accumulation	Solid	TNT	0.421	D001	C-14	A	0.034
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- (Specify) -- Waste Adhesive	Facility maintenance activities	Solid / liquid	Ignitable liquid	0.029	D001	Co-60, Cs-134, Cs-137		0.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- (Specify) -- Adhesives	Storage for on-site treatment. Unable to treat, ship, or dispose of waste.	Solid / semi-solid	Ignitable adhesives	0.218	D001	Co-60, Fe-55, Cs-137, Cs-134, Co-58, Mn-54	A	0.005

Table B-2. Corrosive waste stored as of December 31, 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Chyromatograph gels. Decay of short half life isotope	Absorbed liquid	Phenol	0.631	D002	P-32, I-125, S-35	A	30
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Chyromatograph gels. Decay of short half life isotope	Absorbed liquid	Phenol	0.631	D002	P-32, I-125, S-35	A	30
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Aqueous	On-site storage for accumulation.	Aqueous	Naoh Sol.	0.872	D002	Co-60, Co-58, Fe-55	A	0.680
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Mercury-Containing Waste	Storage for treatment on-site	Aqueous	H2S04	0.436	D002	Co-60, Mn-54, Fe 59	A	0.388
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- (Specify) -- Steam gen. cleaning	On-site storage for accumulation before ultimate off-site treatment or disposal	Aqueous	Parkerizing sol	2.615	D002	Co-60, Co-58, Fe-55	A	2.040
Medical (Non-Federal) -- Research - Large quantity generator (>1,000 kg/month)	Other -- (Specify)	Inorganic acid solutions from research. Storage for decay (T 1/2 < 65 days) - Unable to treat, ship or dispose	Aqueous Liquid	Corrosive	0.019	D002	H-3, P-32, I-125	A	13.000
Industrial -- Research & Development (Analytical lab for environmental samples & mixed waste) -- Large quantity generator (>1,000 kg/month)	Other -- (Specify)	Lack of disposal options	Bulk Liquid	Corrosive	0.931	D002	Uranium (Nat)	A	0.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- (Specify) -- Corrosive liquids	Storage for on-site treatment.. Accumulation for future treatment.	Bulk liquid	Corrosive liquids	0.218	D002	Co-60, Fe-55, Cs-137, Cs-134, Mn-54	A	0.002
Academic >20,000 Students -- Large quantity generator (>1000 kg/month)	Acids	Decay in storage	Liquid	Acetic acid	1.147	D002	I-125	A	0.091

Table B-2. Corrosive waste stored as of December 31, 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Liquids Aqueous, Absorbed	Tool decontamination process. Storage for future treatment	Liquid	Acid	0.654	D002	H-3, Mn-54, Fe-55, Co-58, Ni-63, Zn-65, Cs-134, Cs-137, Co-60	A	0.000
Academic >20,000 students	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Accumulation/not in form accepted by waste broker	Liquid	P058, P115 acid	0.084	D002	Uranium, thorium	A	0
Academic <10,000 Students -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Electrophoretic and chromatographic elutions	Liquid	Phenol	0.042	D002	P-32	A	2
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1000 kg/month)	Other (Specify) -- Phosphoric Acid (Corrosive)	Storage until neutralization can be performed	Liquid	Phosphoric acid	1.308	D002	Co-60, Cs-137, Mn-54	A	0.000
Academic <10,000 Students -- Large quantity generator (>1000 kg/month)	Other - (specify) - Liquids aqueous	Storage for accumulation - Waiting for disposal option	Liquid, small vials	Various	0.021	D002	H-3, C-14	A	15
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Other (Specify) -- Acid			Acid	0.218				
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1,000 kg/month)	Other - (Specify)	Storage for generator treatment - awaiting on site processing	Solid	Electropolisher Filters/ Phosphoric Acid	3.467	D002	Co-60, Cs-137, Fe-55, Zn-65	A	0.000

Table B-3. Reactive waste stored as of December 31, 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic 10,000-20,000 Students -- No EPA Classification	Other biological waste	Decay/ accumulation for offsite treatment	Liquid	Formaldehyde	0.191	D003	H-3	A	0.026
Academic 10,000-20,000 Students -- No EPA Classification	Lead-Containing Waste	Accumulation for offsite treatment	Liquid	Osmium Tetroxide	0.019	D003	U-238	A	0.00033
Academic >20,000 students -- Small quantity generator (100-1000 kg/month)	Liquids Aqueous -- Solidified	Electron microscopy	Solid	Uranyl nitrate, thorium nitrate	0.038	D003	U-238, Th-232		0.08
Industrial -- Manufacturing (50-200 employees on site) -- Large quantity generator (>1,000 kg/month)	Other -- Metal fines	Casting/cleaning. Storage for generator treatment on-site	Solid	Reactivity III (2)	9.309	D003	Th-232	A	7.100
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Mercury-Containing Waste: Elemental mercury	Permanent on-site storage, no treatment or disposal facility	Solid	Mercury	64.143	D003	U-235, U-238	A	255.600
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Research	Solid	Potassium cyanide	0.004	D003	C-14	A	0.001
Academic 10,000-20,000 Students -- Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Research. Unable to treat/ship	Solid	Sodium cyanide	0.004	D003	C-14	A	0.001

Table B-4. Characteristic metal waste stored as of December 31, 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1000 kg/month)	Liquids Aqueous, Absorbed	Rust inhibitor / close cooling water. No disposal options.	Absorbed	Chromate	0.218	D007	Co-60, Mn-54, Cs-137	A	1.000
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1000 kg/month)	Liquids Aqueous, Absorbed	Rust inhibitor / close cooling water. No disposal options.	Absorbed	Chromate	0.218	D007	Co-60, Mn-54, Cs-137	A	1.000
Industrial -- Manufacturing (50-200 employees on site) -- Large quantity generator (>1,000 kg/month)	Liquids Aqueous - Absorbed -- Toxic	On-site storage for accumulation - Unable to ship or dispose of the waste	Un-compacted Solid	Lead	1.396	D008	H-3, K-40	A	0.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generator (100-1000 kg/month)	Other -- (Specify) -- Chromated Water	On-site, storage for treatment in 1991	Aqueous	Chromate	3.894	D007	Co-60	A	0.019
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Aqueous -- Absorbed	Mixed waste interim status TSDF awaiting treatment and/or disposal technology	Aqueous	Lead, mercury, barium, chromium, cadmium	0.872	D008, D009, D005, D007, D006	Co-60, Cs-137, Ni-63, Ni-59, Fe-59, Co-58, Fe-55, Mn-54, Sr-90, Nb-95, Tc-99, Cs-134, Sr-89, Pm-147	A	1.000
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Aqueous -- Absorbed	Mixed waste interim status TSDF awaiting treatment and/or disposal technology	Aqueous	Lead, mercury, barium, chromium, cadmium	0.872	D008, D009, D005, D007, D006	Co-60, Cs-137, Ni-63, Ni-59, Fe-59, Co-58, Fe-55, Mn-54, Sr-90, Nb-95, Tc-99, Cs-134, Sr-89, Pm-147	A	1.000
Government -- Federal (Research & Development) -- Large quantity generator (>1000 kg/month)	Lead-Containing Aqueous liquids	Permanent on site storage	Liquid	Lead Contaminated Aqueous	0.100	D008	U-238	A	2
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity reactor (>1000 kg/month)	Mercury Containing Waste (Liquids)	Accumulation for future treatment / shipment	Aqueous	Mercury	0.048	D009	Co-60, Cs-134, Cs-137	A	0.000
Nuclear Reactor Facility -- Pressurized Water Reactor	Mercury-Containing Waste (Liquids)	No treatment capability	Aqueous	Mercury	0.086	D009	Co-60, Cs-137	A	0.080

Table B-4. Characteristic metal waste stored as of December 31, 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generator (100-1000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.) -- Antifreeze	Antifreeze changeout. Lack of treatment facilities	Bulk liquid	Chromium	0.349	D007	Co-60, Cs-134, Cs-137	A	0.017
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- (Specify) -- Chromated Water	Storage for on-site **treatment.**. Accumulation for future treatment.	Bulk liquid	Chromated water	0.218	D007	H-3	A	0.019
Academic >20,000 students -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste	Research. Storage for accumulation	Bulk liquid	Lead	0.287	D008	H-3, C-14	A	0.1
Academic 10,000-20,000 Students Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.) - Flammable	Research procedure	Liquid	Chromium	0.002	D006			
Medical (non-Federal) --Research -- Large quantity generator (>1000 kg/month)	Other - Specify (Liquid Chromium)	Biomedical research	Liquid	Chromium	0.001	D007	Cr-51	A	1
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1,000 kg/month)	Mercury-Containing Waste: Elemental mercury	Pressure and level gauge. Unable to dispose of waste - On-site storage. Comments: Michigan has been banned from burial ground use as of November 1990.	Liquid	Mercury	0.029	D009	Cs-137, Co-60, Mn-54	A	0.000
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Mercury-Containing Waste	Maintenance	Liquid	Waste paint (w/ possible F-003)	0.218				
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Liquid Aqueous -- Solidified	On-site storage for accumulation before ultimate off-site treatment or disposal	Aqueous	Chromate	0.872	D007	Co-60, Co-58, Fe 55	A	0.680
Academic >20,000 students -- No EPA Classification	Lead-Contaminated trash	Lead Sulfate ppt. Storage for accumulation to ship (210Pb)	Non-compacted solid	Lead sulfate PPT	0.084	D008	Pb-210	A	0.0015
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Mercury-containing waste (sludge from floor and equipment drains in an evaporator)	Storage for generator treatment (SI). Unable to treat, ship, or dispose of waste.	Sludge	Mercury in evaporator	11.623	D009	Cs-137	A	1.100

Table B-4. Characteristic metal waste stored as of December 31, 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- (Specify) -- Surface Impoundment sludge	Storage for generator treatment (SI). Unable to treat, ship, or dispose of waste.	Sludge	Pb, Ni, VA state hazardous	116.229		Cs-137, Co-60	A	0.028
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- Plant Wastewater Treatment (OWS)	Storage for generator treatment (SI). Unable to treat, ship, or dispose of waste.	Sludge	Cr, Pb, Va (state hazardous)	14.529		Cs-137, Co-60	A	0.220
Academic >20,000 students	Lead-Containing Waste: Shielding	Contaminated shielding. Storage for decay, then treatment	Solid	Lead	0.004	D008	P-32, I125	A	0.01
Industrial -- Manufacturing (50-200 employees on site) -- Large quantity generator (>1,000 kg/month)	Other -- Metal fines	Melting of Mag/2% Th metal. Storage for accumulation on-site - for shipment	Solid	Barium	34.909	D005	Th-232	A	16.200
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Filter Media -- Dewatered	On-site storage for accumulation before ultimate off-site treatment or disposal	Solid	Chromated filters	0.436	D007	Co-60, Co-58, Fe 55	A	0.340
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Other (Specify) -- Chromium Waste - Flammable	Uranium recovery dissolution. Permanent on-site storage, no treatment or disposal facility	Solid	Chromium	29.020	D007	U-235, U-238	A	3,272.600
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Neutron shield process chemical	Solid	Chromated trash	0.218	D007	H-3, Mn-54, Fe-55, Co-58, Ni-63, Zn-65, Cs-134, Cs-137, Co-60	A	0.000
Government -- Federal (Military) -- Large quantity generator (>1000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Maintenance and repair of U.S. Navy ships, no mixed waste treatment or disposal capacity	Solid	Chromate	2.834	D007	Co-60	A	0
Academic >20,000 Students -- Large quantity generator (>1000 kg/month)	Lead Containing Waste - Shielding	Complex disposal methods must be done	Solid	Lead	0.076	D008	Co-60	A	0.72
Government -- Federal (Research & Development) -- Large quantity generator (>1000 kg/month)	Lead-Containing Shielding	Permanent on site storage	Solid	Lead Shielding	0.033	D008	C-136	A	1

Table B-4. Characteristic metal waste stored as of December 31. 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Government -- Federal (Military) -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste	Unable to dispose	Solid	Lead	5.152	D008	Co-60	A	0
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Lead-Containing waste		Solid	Lead	1.743	D008			
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste	Unable to treat, ship, or dispose of waste.	Solid	Waste containing lead	0.218	D008	Cs-137, Cs-134, Co-60, Mn-54, Co-58, Fe-55	A	0.002
Academic <10,000 Students -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste (contaminated bricks)	Activated Lead Bricks. Using as shields - must be treated before disposal	Solid	Lead	0.191	D008	Bi-207	A	10
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1000 kg/month)	Lead-Containing Waste - Sheeting	Shielding. No disposal options.	Solid	Lead	0.639	D008	Co-60, Mn-54, Cs-137	A	10.000
Nuclear Reactor Facility -- Boiling Water Reactor -- Small quantity generator (100-1000 kg/month)	Lead-Containing Waste: Batteries	Accumulation for off-site reprocessing	Solid	Battery	0.015	D008	Cs-137		0.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste: Blankets	On-site storage for accumulation before ultimate off-site treatment or disposal	Solid	Lead	0.218	D008	Co-60, Co-58, Fe 55	A	0.170
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste: Blankets	Permanent on-site storage. Unable to treat.	Solid	Lead	0.436	D008	Fe-55, Ni-63, Co 60, Nb-95, Cs-137, Cs-134, Co-58, Mn-54	A	0.000
Nuclear Reactor Facility -- Pressurized Water Reactor -- Small quantity generator (100-1,000 kg/month)	Lead-Containing Waste: Other	Penetrating sealant. Storage for accumulation - Unable to treat, ship or dispose	Solid	Lead	0.436	D008	Co-60, Cs-137	A	0.000
Academic 10,000-20,000 Students Large quantity generator (>1000 kg/month)	Lead-Containing Waste: Shielding	Contaminated Shielding. Unable to dispose of waste	Solid	Lead	0.026	D008	Cs-137, I-125	A	0.01

Table B-4. Characteristic metal waste stored as of December 31, 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste: Shielding	Piping penetration shielding. Permanent on-site storage. Unable to treat.	Solid	Lead	1.090	D008	Fe-55, Ni-63, Co 60, Nb-95, Cs-137, Cs-134, Co-58, Mn-54	A	0.000
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1,000 kg/month)	Lead-Containing Waste: Shielding	Unable to dispose of waste	Solid	Lead	0.174	D008	Cs-137, Co-60, Mn-54	A	0.000
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste: Shielding	Unable to treat, ship, or dispose.	Solid	Lead	1.743	D008	Co-60, Mn-54, Fe-59	A	1.360
Nuclear Reactor Facility -- Research & Test Reactors	Lead-Containing Waste: Shielding	Storage for decay, accumulation and reuse.	Solid	Lead (Fabricated)	0.070	D008	Sb-124	A	10.000
Academic >20,000 Students -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste: Shielding	Waste from Research activities. Storage on site for decay	Solid	Lead Shielding	0.057	D008	I125	A	3
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1000 kg/month)	Mercury-Containing Waste (Solids)	Scrap glass from lamps, accumulation for shipment	Solid	Mercury	0.422	D009	Th-32	A	0.24
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Ion Exchange Resins - Dewatered	Residue from treatment of chromated water. Storage for accumulation. Unable to treat, ship, or dispose of waste.	Solid	Ion-exchange resin	0.654		Cs-60, Fe-55, Cs-137, Cs-134	A	0.004
Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity generator (>1000 kg/month)	Other -- (Specify) -- NICD Batteries	Storage on-site awaiting disposal options. Unable to treat, ship, or dispose of waste.	Solid / liquid	Corrosive liquid , cadmium	0.145	D006	Co-60, Cs-134, Cs-137		0.000
Government -- Federal (Military) -- Large quantity generator (>1000 kg/month)	Ion Exchange Resins - Solidified (Toxic)	Maintenance and repair of U.S. Navy ships. On site storage pending availability of mixed waste disposal site	Solid resins	Chromium	1.065	D007	Co-60	A	155.5

Table B-4. Characteristic metal waste stored as of December 31, 1990. 6 of 6

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Industrial -- Waste Broker/Processor -- Large quantity generator (>1,000 kg/month)	Incinerator Ash or Residuals	Storage for generator treatment (solidification / drying) or accumulation	Solid/Ash	Cadmium, Chromium, Lead	25.326	D006, D007, D008	Co-60, Cs-137, Fe-55	A	0.000
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1000 kg/month)	Mercury-Containing Waste (Liquids)	Tracer preservative	Solidified	Mercury	1.055	D009	I-125, Co-57	A	75.76
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Irradiated Reactor or Pool Components	Spent reactor control rods (cadmium); permanent on site storage	Un-compacted solid	Cadmium	0.034	D006	Cd-109, Ag-109m, Cd-113m, Fe-55, Co-60	B	84000
Government -- Federal (Research & Development) -- Small quantity generator (100-1000 kg/month)	Lead-Containing Waste -- Shielding	Parts of decommissioned experiments/reactor shielding; permanent on site storage	Un-compacted solid	Lead	1.717	D008	Co-60, Mn-54	A	2
Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1000 kg/month)	Lead-Containing Waste -- Other	Ash from station stack	Un-compacted solid	Lead	2.789	D008			
Industrial -- Manufacturing (50-200 employees on site) -- Conditionally exempt small quantity generator (<100 kg/month)	Lead-Containing Waste: Lead-contaminated trash	Thin film evaporation. Storage for accumulation	Un-compacted Solid	Lead	2.048	D008	Th-232	A	0.220

Table B-5. Characteristic organic waste stored as of December 31, 1990.

Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (cubic meters)	EPA Waste Code	Radionuclides	NRC Class	Cumulative Activity (mCi)
Academic >20,000 students -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Cell washes, disposal nationwide	Absorbed Aqueous	Trichloromethane, phenol	0.051	D022	H-3	A	0
Academic >20,000 students -- Small quantity generator (100-1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Cell washes, disposal nationwide	Absorbed Aqueous	Trichloromethane, phenol	0.051	D022	H-3	A	0
Industrial -- Research & Development -- Conditionally exempt small quantity generator (<100 kg/month)	Liquid Organic - (Solvents, Chlorinated Solvents, etc.) -- Toxic	Storage for decay	Bulk Liquid	Chloroform	0.001	D022	P-32	A	0.300
Industrial -- Research and Development -- Small quantity generator (100-1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Storage for accumulation	Liquid	Chloroform	1.442	D022	H-3	A	1.000
Academic >20,000 students -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.) -- Reactive	Research. Orphan waste	Liquid	Solvents	0.004	D022	H-3, C-14	A	4
Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Permanent onsite storage until method of treatment becomes available	Liquid	Chloroform, and methylene chloride	0.152	D022, D001	H-3	A	3243.26
Academic >20,000 Students -- Large quantity generator (>1000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Research	Liquid	2,4,6-trichlorophenol, aniline	0.015	D042, D001			
Academic 10,000-20,000 Students -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Organic (Solvents, Chlorinated Solvents, etc.)	DNA Extraction.	Solid	Chloroform	0.071	D022	P-32	A	1